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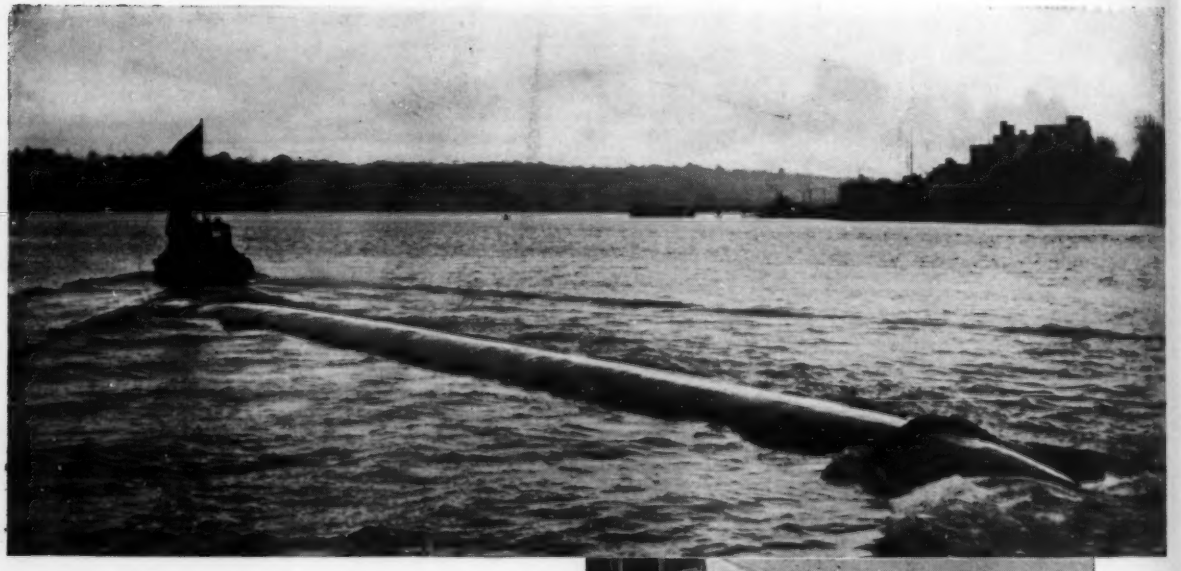

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IN ITS 76th YEAR

December 12 1959

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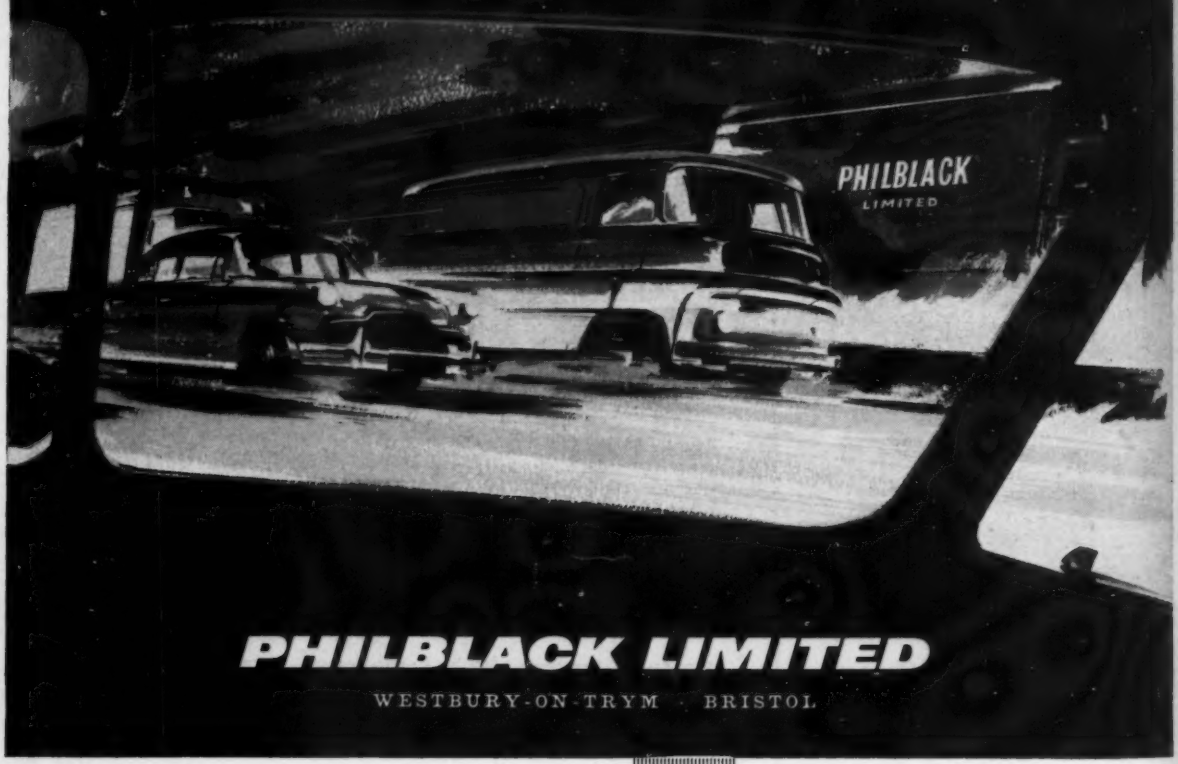

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NOTES of the WEEK

No Division

LAST week Sir Harry Melville said that if the two industries (rubber and plastics) could come together it would be a good thing. Although it may perhaps be regarded in certain quarters as something approaching heresy, this statement by the Secretary of the Department of Scientific and Industrial Research could hardly be more topical. Sir Harry, who was speaking at a regional meeting in London organized by the Research Association of British Rubber Manufacturers—attended, incidentally, by a number from the plastics industry—then went on to say that the difference between elastomers and plastomers was scientifically non-existent. It seemed artificial, he said, that there should be a dividing line between industries based on the same materials and techniques. Sir Harry's concern on this occasion was, of course, research, and his particular point that the two industries should get together for this purpose, for there is not, at present, a research association, as such, for plastics in this country. The Research Association at Shawbury is, of course, already doing plastics research and the trend towards extra efforts in this direction is increasing both in scope and pace. In fact, one gets the impression that whether or not RABRM speedily becomes in name RABRPM (or other variation) the Association has every intention of equipping itself for a comprehensive onslaught on research in the field of plastics, a field, after all, in which an increasing number of its members have for a considerable time had an interest. Another angle mentioned by Sir Harry Melville in pointing out the advantages of collaboration was financial benefit. Overheads in small research associations could, he said, absorb a great amount of money. Also, he added, from the scientific and technological viewpoint it was not a very big step to take. As was demonstrated at the meeting referred to above (and reported elsewhere in this issue), RABRM has, in effect, already taken that step. There can, surely, be no doubt that the plastics industry will find it of advantage to share in the endeavour.

Hazy Line

ON the other side of the Atlantic last month George R. Vila, Group executive vice-president, United States Rubber Co., touched on the same subject in an address in New York to the annual meeting of the Rubber Manufacturers' Association. He said, ' It is likely, within the foreseeable future, that the rubber industry will evolve into a polymeric complex in which the hazy line now separating plastics from rubber will be completely erased.' He listed three broad reasons for rubber companies entering the plastics field. First, processing techniques and equipment used in fabricating many plastics were similar to rubber production methods and machinery. Second, many plastics had grown through invasion of markets previously served by rubber. Third, the versatility of plastics had led to many new applications, thus broadening the horizons of rubber companies. In a far-reaching survey of future economics and trends, Mr Vila mentioned—highly relevant to the ' hazy line ' —the breakthrough to ' stereo-regular ' rubbers, such as the *cis*polyisoprenes and the *cis*polybutadienes, leading, potentially, to the ethylene-propylene copolymers. ' But,' he concluded, ' the modern rubber industry which has had the vigour and inventiveness to reach its present state of development will also have the vision and dynamics to exploit fully the opportunity now before it.'

Education and Training

THE creation by the Plastics Institute and the British Plastics Federation of a Joint Committee on Education and Training, set up recently and announced this week, is a laudable and necessary move that follows essentially on the considerable advances made in the past few years through the Institute's examination schemes. The new Committee, directly responsible to the Councils of the PI and the BPF, is to concern itself with education and training relating specifically to the plastics industry, and to other industries where scientists and technologists trained in the use of plastics materials are required. In the preliminary statement issued by the Committee it is stressed that much remains to be done by way of reassessing the needs of industry for qualified people at craft, technician and professional level, and for extending apprenticeship facilities. The Committee has made a start by seeking the cooperation of the industry on a number of points. Plastics companies are being asked, for instance, to state whether they are prepared to take Diploma of Technology students; whether they would support Craft Courses for plastics process operators by providing candidates or whether they are interested in pupil apprenticeship schemes. Another venture, directly linked with the aims of the Committee and which could prove of very real value not only to the Ministry of Education and educational establishments but to the industry, is the inauguration of a manpower survey. Companies in the plastics industry are being asked to estimate the number of new, qualified employees—specified under the headings of ' chemists,' ' engineers,' ' physicists ' and ' plastics technologists '—which they are likely to require over the next four years.

NEWS *Briefs*

UK PLANT FOR SIBERIA—DORDRECHT ORLON FACTORY—INDIAN SR PROJECT—BRAZILIAN RUBBER—SUMATRA ESTATES—MEXICAN TRADE

●**China** — The tenth session of the Sino-Soviet Commission on Scientific and Technical Co-operation has been held in Peking. It is understood that Soviet institutions are to provide China with documents relating to physico-chemical research in high polymer compounds.

●**Siberia**—A contract to supply a complete synthetic rubber plant for delivery in Siberia has been secured by a Glasgow engineering firm, John Dalglish and Sons Ltd., it has been announced in Glasgow. The contract is worth more than £500,000, the announcement said, and followed negotiations in Moscow.

●**Brazil**—It has been announced that light rubber goods industries will receive an annual total allocation of 10,000 tons of Brazilian raw rubber, thus being relieved of the need to import supplies.

●**Japan**—A spokesman for the Japan Rubber Manufacturers' Association said in Tokyo that the Japanese motorcar tyres industry had suffered a loss of 350,000 US dollars, and the Japanese rubber footwear industry a loss of 14,100,000 yen as a result of restriction imposed last October by the Iranian Government on imports of Japanese rubber articles.

●**Mexico** — Mexico's imports of natural or artificial crude rubber during the period January-August 1959 totalled 18,767 tons worth 126,900,000 pesos, as compared to 18,760 tons worth 115,600,000 pesos during the corresponding period of 1958.

●**Brazil**—In 1958, Brazil produced 32,758 tons of rubber and 1,985,000 tyres, as against 29,498 tons of rubber and 2,185,000 tyres in 1955. Production in 1962 is expected to be 130,000 tons of rubber and 5,817,000 tyres.

●**The Netherlands**—Construction of a new orlon factory at Dordrecht is expected to start soon. The factory is being built by du Pont de Nemours (Nederland) N.V. and will have a capacity of 15m. lb. a year. Production is expected to start in 1961.

●**United States**—Monsanto Chemical Co. has announced that it will build a plant within the European Common Market to make Saflex polyvinyl butyral plastic sheet, a product used in safety glass. The plant will begin production by late 1960 or early 1961. Site studies were nearly complete and results would be announced later, the company said. Value of the plant, its size, planned production capacity, or number of employees was not disclosed. It was described only as 'a multi-million dollar plant.'

●**Indonesia**—Harrisons and Crosfield Ltd. has reopened its rubber estates in Aek Tarum, North Sumatra, according to the Estates Relations Office in Medan. They had been closed since July 1958 following the adverse security conditions brought about by the outbreak of the Central Sumatra rebellion earlier in that year.

●**United Kingdom**—An order worth £24,000 has been placed with the RFD Co. by the Scandinavian Airlines System for 78 26-man inflatable rubber liferafts.

●**Indonesia**—The Head of the Indonesian Foreign Economic Relations Directorate has stated that Indonesia will export 20,000 tons of rubber to the USSR in 1960. The agreement was signed in Moscow recently.

●**Russia** — According to the Central Statistical Board of the USSR Council of Ministers, reporting on the results of the fulfilment of the State Plan by Soviet industry during the third quarter and first nine months of 1959, gross output of the chemical and rubber industry during the first nine months of 1959 was 110% of the corresponding period of 1958. Production of motor tyres totalled 11¼m., or 108% of the corresponding period of 1958. Production in the chemical industry has risen significantly, the output of synthetic resins and plastics has increased by 14% (including alkyd resins, by 25%); cellulose ethers, by 12%; polychlorvinyl resin and co-polymers, by 18%; the output of synthetic ethyl spirits rose by 47% and synthetic fatty acids by 59%. The plan for the output of chemical equipment has fallen somewhat short of fulfilment, although the output has increased, compared to the corresponding period of 1958.

●**Japan**—The Japan Rubber Manufacturers' Association said Japan's requirements for natural and synthetic rubber during 1960 were expected to total 212,000 tons. This represented an increase of 9.3% over the estimated 1959 crude rubber consumption. The total comprises 170,000 tons of natural rubber, including latex, and 42,000 tons of synthetic rubber, which also includes latex.

●**Nicaragua** — According to provisional figures for 1958, Nicaragua imported rubber and manufactures amounting to US$2,400,000, representing 3.1% of the country's total imports. This compares to US$2m. (2½%) for 1957 and US$1,900,000 (2.8%) for 1956.

●**India** — A synthetic rubber plant, worth £18¾m., is to be set up at Bareilly, in Uttar Pradesh, India, with US technical and financial collaboration. The project is expected to meet, to a large extent, the growing demand for rubber, and will help save over £3,700,000 a year in foreign exchange, once the plant starts production.

'It's an absolutely monstrous suggestion, but we'll certainly consider it'—462

Report on Work at RABRM

SIR HARRY MELVILLE ON NEED FOR PLASTICS RESEARCH

IN London on December 3, Sir Harry Melville, the Secretary of the Department of Scientific and Industrial Research, advocated that the rubber and plastics industries get together to provide Research Association facilities for both industries. For some time, he said, talks had been going on within the plastics industry and with his Department and the Research Association of British Rubber Manufacturers on this question, and he expressed the hope that with the Department's backing these would soon show some definite results.

Certainly, said Sir Harry, the difference scientifically between elastomers and plastomers was non-existent. It seemed an artificial state of affairs that there should be a dividing line in research between the industries based on common polymeric materials and techniques. Scientifically and technologically, it did not seem a very big step to take to embrace plastics as well as rubbers.

There was, of course, said Sir Harry, another great advantage in collaboration, namely a financial one. Overheads, for instance, could absorb a high proportion of the expenses of any smallish organization. If the two industries came together for collective research as they are doing in other respects, they would reap the benefit financially as well as other benefits of a unified association. He hoped this would soon come about.

Financially Sound

Sir Harry Melville said he was particularly interested in the work of RABRM because it operated in a field in which he had some personal experience. After outlining the method adopted by DSIR for financing research associations, Sir Harry said how glad he was that RABRM's finances were in such a satisfactory state. They had, he added, almost reached the ceiling in the first year of the new terms to gain the maximum grant from the Department. They were welcome at any time to approach the Department for revised terms, although it would be inconvenient if all research associations were doing as well.

The occasion of Sir Harry Melville's address was the London Regional Meeting of RABRM members held at the Piccadilly Hotel from 12.30–6 p.m. on December 3. This was the third of four, meetings having been held in Glasgow and Leeds previously and on December 10 in Manchester. These enable member companies to hear at convenient centres of the work of the past year and comment on the programme for the forthcoming year. More than two-thirds of the 250 member firms will have had representatives attend these meetings. An interesting, enjoyable, and efficiently arranged afternoon was provided for the 130 representatives of some 70 firms present.

Ambitious Programme

Mr H. W. G. Chichester-Miles, vice-chairman of Council, said from the chair what a great encouragement it was to the RABRM Council that members of the association had responded so well to the Council's policy of attracting from existing members an income fixed at £80,000 per year for the next five years. He referred to the association's 'ambitious and well-spread programme for 1960; the best I have ever seen.' The association now had the power, the equipment and the staff and they would render excellent service to their members.

Dr W. F. Watson, director of research, had introduced Sir Harry Melville as the most senior official of the association's largest subscriber, the DSIR being at once the father and fairy godmother of the Research Association movement. Without the backing of DSIR, there might still be a Research Association, but clearly it would not be able to approach the amount of service it could provide with the Department's backing.

Dr Watson outlined the programme proposed for 1960. He emphasized that the association has many-sided activities, only very elastically described under the heading of research, in its broad and flexible purpose of being of greatest technical value to its members. They had achieved their 1959 target of visiting for technical discussion every member's factory, and much of their future programme was based on the first-hand knowledge of the industry's problems so obtained. He then briefly summarized the 18 items of the programme, including oxygen, ozone and light-ageing studies, vulcanization, stress-strain investigations, friction, continuous vulcanization and other processing, evaluation of raw materials, library, intelligence, and enquiry services. On the latter subject, he said, 95% of enquiries had in 1959 been answered by a 'cannonball' 24-hour service.

Dr W. C. Wake then opened the lecture session with an illustrated talk on the productivity services of RABRM. Studies made recently and continuing included those into mastication, mixing, drug room (powders) and extruder performance. He went on to outline the reasons for differences in efficiency as between factories which they had formulated as a result of factory visits. Attention to the conclusions reached had markedly improved productivity in the factories surveyed and could equally be applied to others. The results were shortly to be published in a simple, readable, form.

The year's work on standards was then described by Dr J. R. Scott. Ten members of RABRM senior staff, he said, were serving on some 22 British Standards Institution committees. Besides this, three members were serving on International Standards Organization committees. Their main concern, he said, was with methods of testing and analysis. He recalled that the proposals in British test methods, BS 903, for rubber had originated with RABRM. They were also concerned in the field of product standardization. The current cost to RABRM of their work on standardization was, he said, about 3% of their total expenditure.

Test Methods

Nine active BSI sub-committees were at present working on aspects of rubber test methods, *i.e.*, chemical tests, electrical and ebonite tests, tests for latex, cellular rubber, proofed fabrics, detection of trace metals and rubber thread. Mechanical tests included much recent work on microhardness testing, low temperature stiffness and ozone cracking. The committees also did much work in connexion with ISO. A major item in the work of the committee dealing with chemical tests and analytical methods, under the chairmanship of Dr Wake, was the identification and qualitative estimation of the various polymers now used in rubber manufacture; the whole section of BS 903

dealing with polymer determinations was being revised.

After describing the work of the product committees on which RABRM was represented and the large part played in ISO recommendations on rubber by the association, Dr Scott went on to say that active consideration had been given over the past year or so to the problem of co-ordinating standardization work on rubber and plastics, another instance where inevitably the two industries had come together. Since many laboratories were now called to test both rubber and flexible plastics, basically the same properties being examined in many cases, there was no logical reason for any difference in test procedures. It had been decided in BSI to set up a special joint co-ordinating committee comprising representatives of the rubber and plastics industries committees. In the international field a similar linking-up was taking place. Observers from the ISO rubber committee attended meetings of the plastics committee and *vice versa*. The establishment of joint technical committees had been proposed.

Following Dr Scott, Mr R. C. W. Moakes gave an interim report on recent investigations of the factors involved in 'scuffing' of proofed nylon tarpaulins undertaken with British Nylon Spinners Ltd. He explained that the project was the first under a new scheme which enabled a member, or members, to contribute financially and technically towards accelerating a particular research project. Results were not confidential to such members and so benefited all members. This particular project was concerned with the rubbing-away, particularly on lorries, of surface-proofing by the action of retaining ropes or the sharp edges of the load.

Mr Moakes described tests made on proofings of PVC, neoprene, and polyurethane, and a RABRM machine made to measure surface frictional forces when a rope was dragged over surface proofings was demonstrated. Results so far obtained, he said, did not indicate large differences in surface friction forces between proofings prepared with different polymers or between proofings with different plasticizers in one polymer (PVC). It looked as though bulk properties of the proofing and associated abrasion resistance were the major factors affecting improved service of proofed nylon tarpaulins. Further, adhesion and tear tests suggested that a minimum tear resistance of about 60lb. and an adhesion of about 200-250 psi was required.

The final talk of the session by Dr Wake substituting for Mr R. H. Norman, was on the subject of the frictional properties of flexible PVC. The first-order correlation of friction of plasticized PVC against steel with its bulk softness measurement was brought out.

The proceedings concluded with a discussion on the papers presented, informal discussion, and a working exhibition of the Shawbury-Wallace Curometer, electronic tensile tester, rope friction and PVC-steel friction machines.

New Firestone Tyre

The Firestone Tire and Rubber Company has announced plans for the introduction of a Firestone premium quality tyre made of butyl rubber. This will be the first premium butyl tyre to be added to the line of any major rubber company. The company stated that for the past several years Firestone tyre development engineers had been experimenting with butyl rubber for tyres because of some of its favourable characteristics. He further stated that Firestone's Fort Stockton, Texas, test fleet had run millions of miles on butyl rubber and had found it to have excellent soft ride qualities and extreme cornering quietness, which were very desirable characteristics in a tyre. These exhaustive tests also indicated that the new butyl tyre had excellent weather checking characteristics.

IRI Leicester Section

SILVER JUBILEE

TO celebrate the 25th anniversary of the formation of the Leicester Section, a Silver Jubilee Dinner-Dance was held at the Grand Hotel, Leicester, on November 10. Sir John and Lady Dean were to have been present but were unable to do so at the last moment. The principal guests were Mr C. H. Saunders, first chairman of the Leicester Section, Mrs Saunders and Mr G. Martin, chairman of Council. A pleasant coincidence was toasted when it was announced that Mrs. Saunders was celebrating her 80th birthday.

Although this occasion was the Silver Jubilee it was also the Section's 5th Annual Dinner-Dance, an event which has gained in popularity year by year. There were a few brief speeches, Mr Martin proposing the toast of the Leicester Section, Dr Lee replying and Mr Swire proposing the toast of the guests, Mr Saunders replying. Dancing between the courses in the pleasant Grand Hotel atmosphere followed, and after the meal dancing continued until 12.30 a.m. under the able direction of the Master of Ceremonies Mr J. C. Wright.

Further mention of the dinner and dance will be made in the next issue of *RJIP*.

These large brake liners, used by the National Coal Board for mine shaft lifting gear, are 13ft. 5in. long and 19in. wide. The 1in. thick sections of woven asbestos and cotton are bonded with 'Redux' resin adhesive to the metal; four sections are required to cover the circumference of the braking wheel mechanism. 'Redux,' made by CIBA (A.R.L.) Ltd., best known as an adhesive for metal aircraft structures, is being increasingly used for bonding brake liners for industrial machinery as well as for motor vehicles. Mercedes-Benz and Citroen cars employ this adhesive for their brakes and in this country several companies operating buses and taxicabs are taking advantage of the economies offered by the bonding technique

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Building Exhibition

HIGH POLYMER APPLICATIONS

BY DAVID ALEXANDER

THAT plastics are becoming more widely accepted by the building industry, for a large number of applications, was very evident at the recent Building Exhibition at Olympia, London, November 18 to December 3.

Of particular interest was a pipework display by Yorkshire Imperial Metals Ltd. This included the new 'Polyorc B' unplasticized PVC, which represents the latest development of a completely unplasticized PVC designed primarily for use in the water industry where it is resistant to various corrosive soils and acid waters. The main application for this material will be for underground mains up to about 6in. bore and for service connexions where it is able to compete against conventional materials, certainly between 2 and 4in. size.

'Polyorc B,' although new to the UK, has been used to a considerable extent in Europe and it seems certain that there will be an increase in the use of unplasticized PVC for this purpose in the UK. Another application for this material is for the conveyance of gas, and, from information available elsewhere, the trend in the gas industry appears to be towards the use of rigid PVC. The material itself has various interesting properties, some details of which are given below. All tests carried out against this programme were at 20°C.

Specific gravity: 1.40.

Flammability: Will not support combustion.

Mechanical properties:

Tensile strength, 6,750 to 7,500 psi. Compressive strength, 9.500 psi. Flexural strength, 13,500 psi. Impact strength Isod, 3.5-4.5ft. lb. per in. notch. Modulus of elasticity, approximately 4,000lb. per sq. in.

Thermal properties:

Coefficient of linear expansion—5.0 x 10—5 per °C., or 2.5 x 10—5 per °F.

(On 10ft. length approximately $\frac{1}{10}$in. per 10°C. or $\frac{1}{32}$in. per 10°F.)

Specific heat—0.25 (cal. per °C. per grm.).

Electrical properties:

Volume Resistivity (ohm/cm.) 10–14.

Power factor (at 10–6 cycles) 0.02.

Dielectric constant (at 10–6 cycles) 3.00.

'Polyorc B' can be manipulated by the usual techniques for other plastic materials but welding presents some difficulties. Some caution is necessary in cutting the threads on this tubing. Another point is that the material is not normally recommended for temperatures above 20°C., which compared with other plastic piping may appear low, but this factor is not important in the handling of ordinary ambian water services.

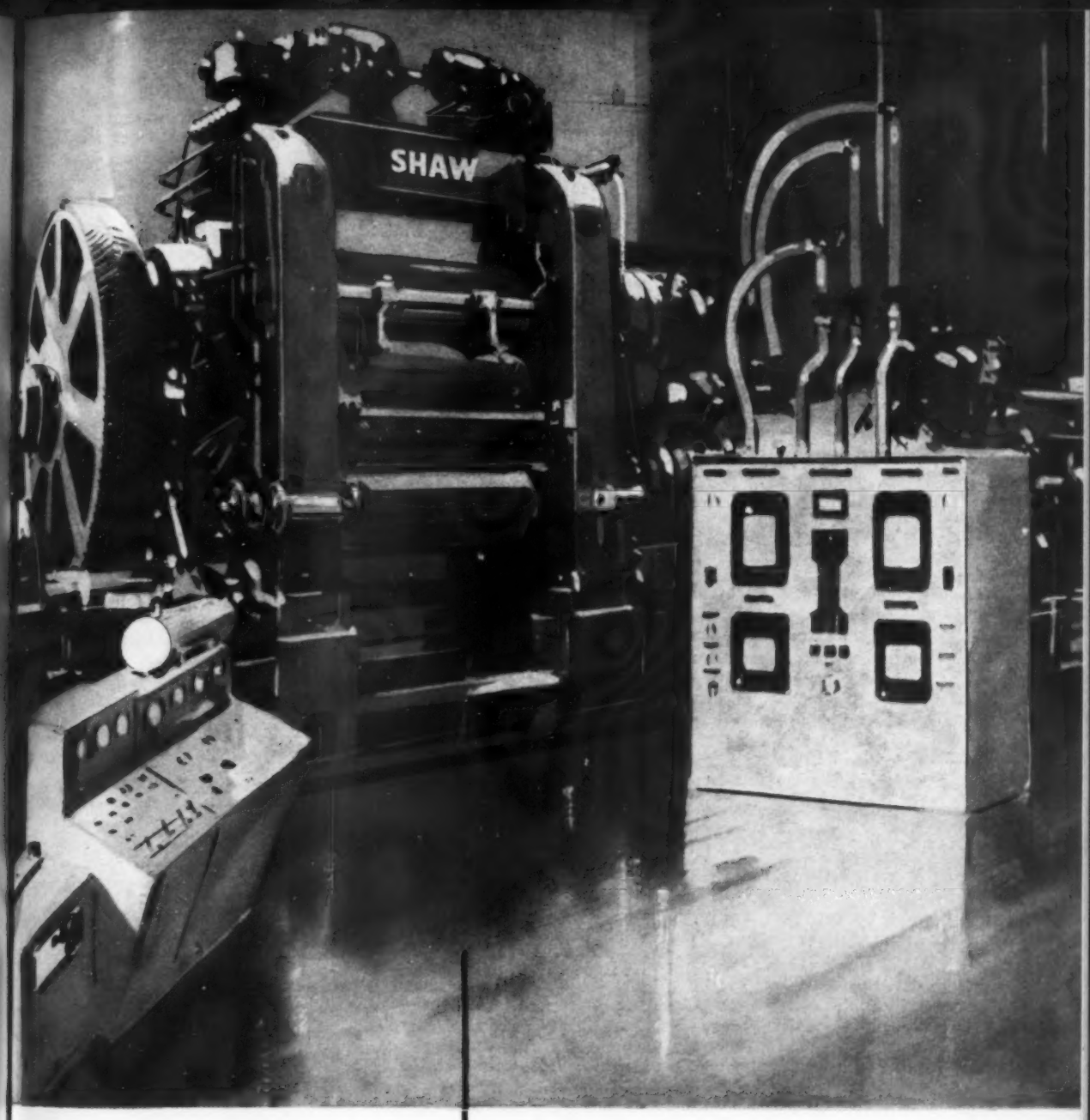
Also on show were a range of moulded fittings in high impact PVC under the grade 'Polyorc BH,' this material has strangely double the linear co-efficient of expansion of 'Polyorc B,' although the electrical properties are very similar. Also available is the new polystantor compression fitting for use with polythene tube to the British Standard Specification 1972. These fittings are made to operate without an internal push fit liner which instead is incorporated in the fitting and counteracts the difficulties previously met with in inserting loose liners. The company also showed a series of joints which employ the use of an O-ring. This practice has not been recommended generally in the UK, but it may be remembered that in the report on the German Plastics Exhibition (*RJIP* Oct. 31), it was suggested that the use of this joint was very much more common on the Continent. YIM state that they have complete confidence in this type of joint (subject to the particular type of application and chemicals involved). The company also emphasized the availability of large reels containing up to 4,000ft. of polythene tube in one continuous length. This service is now beginning to be offered by one or two manufacturers and no doubt in time will be a standard form of packing when required. There is to some extent a limit to the use of polythene tube on reels as for example in the case of $\frac{1}{2}$in. heavy gauge polythene where a 3,000ft. reel would weigh approximately $\frac{1}{4}$ ton.

Washers

Manwood Miller Fans and Filters Ltd., one of the Copperad companies, showed air washers and air cleaners, etc., and it was particularly interesting to see that glass fibre had been used for the filters, this fibre being fitted into $\frac{3}{16}$in. thick rigid PVC fabricated casings (Fig. 1). Apparently this technique has been used elsewhere, a case in point being the new Shell building on the South Bank, London, which will have approximately 30 air washers all made in rigid PVC with polyester glass fibre filters.

Dowty Seals Ltd., Ashchurch, showed a new form of nylon captive sealing washer which is mainly for use in the motor industry. The interesting point about this is that the washer is positively retained and is concentrically located. A new topat cover has also been developed for use with the Dowty roof and wall ceiling washer. This cover is designed to protect threads and heads of bolts either externally or internally when

Fig. 1. Manwood Miller air washers use glass fibre in their filters



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OVERSEAS AGENTS THROUGHOUT THE WORLD

P.3607

they are exposed to high concentrations of industrial fumes, etc. The drawing (Fig. 2) explains how this cover is retained.

I.C.I. showed the new 'Lustalite' window developed by EAW Industries which in effect is a window entirely covered by a thin rigid PVC extrusion. Also of practical interest was a form of snap back jointing made from an extruded PVC section and for use in joining rigid PVC sheet together without welding. This is of particular help in such places as meat markets and food markets where PVC sheet is used to line store rooms.

Jablo Plastics Industries Ltd. had a useful display of 'Jablex' expanded PVC eaves fillers. 'Jablite' insulant material for buildings, and 'Jablinsul,' a foaming *in situ* material for insulation against cold, heat and sound. All of these materials are basically expanded plastics. 'Jablinsul' is an aminoplastic and foaming agent hardened by a catalyser containing stabilizers.

A new form of equipment called the Jablinsul equipment has been developed so that this expanded polystyrene can be used and applied *in situ* in the form of a foam. The recesses in a wall carrying pipes can be used as the mould for forming the shape of the expanded plastic. This process is developed under the patent of the German Schaum-Chemie Company and normally applies the material with a standard density of approximately 1lb. per cubic foot which gives some idea of the weight involved.

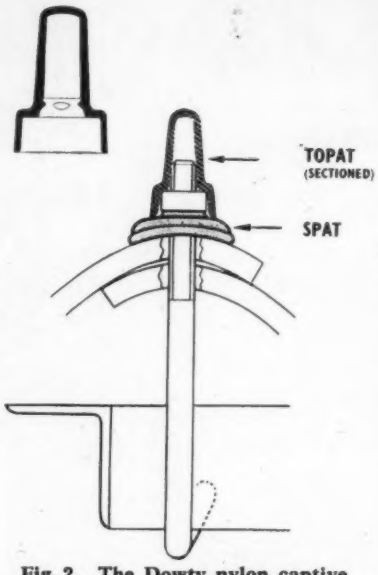


Fig. 2. The Dowty nylon captive sealing washer

Donald Brown (Brownall) Ltd. showed a range of high impact hand wheels and covers coated in an epoxy resin base which is resistant to acid, alkali and solvent materials.

Kay and Co. Engineers Ltd., Bolton, had a wide display of their well-known 'Kontite' fittings including a special fitting of the compression type for use with either normal or heavy gauge polythene.

Shires and Co. London Ltd. showed their (Kingfisher) syphon mechanism which is entirely made of plastics. This syphon is made in a range of sizes to suit every size and make of flat bottom cistern; the illustration shows the compactness of design of this mechanism. (Fig. 3.)

QVF Ltd. showed a wide range of glass pipe systems and a specially developed range of polytetrafluorethylene gaskets for use with these gas pipes.

TABLE 1

Standard Density	Thermal Conductivity	Temperature Range	Water Vapour Permeability (g./sq. ft./24 hr.) ¼-in. thick specimen
1 lb./cu. ft.	0.17 B.Th.U. at low temperature 0.21 B.Th.U. at mean temperature	+ 90°C. to − 300°C.	0.77 (average)

The Xpelair Division of Woods of Colchester Ltd., showed their new 12in. Xpelair fan made from moulded plastic, the outer case and the fan impeller being entirely free from metal.

Rubber Improvement Ltd., Wellingborough, showed 'Rilite,' a form of resin bonded glass fibre sheet. This material is available in four grades, including a fire-protective grade, and has a visible light transmission factor of approximately 85%. The approximate weight per sq. ft. is 6.5oz. which allows its use with very light supporting structures. The material has an ultimate tensile strength of up to 9,000lb. per sq. in. and a thermal conductivity factor of 1.7; the water absorption figure against the BS 1137 is 1%.

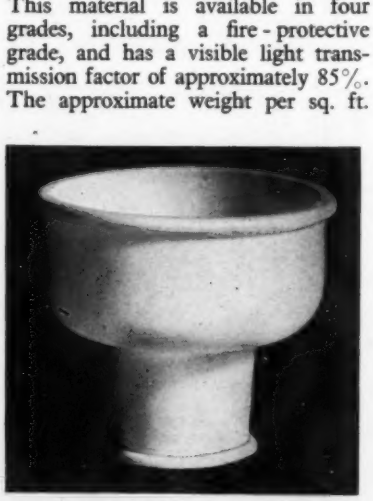


Fig. 3. The Kingfisher syphon mechanism. Shires and Co. London Ltd.

In the same field Marketad Ltd., Shoreham, showed 'Milite' which is also glass fibre reinforced and supplied in corrugated profile. This material has been tested by the joint Fire Research Organization and a certificate has been granted. The main application for the material is for skylights in factories, farm buildings and garages, etc., and is fitted in the same way as normal corrugated sheeting, no special supports being necessary.

In the same field but specializing in roof lights and dome lights particularly were Alan Blunn Ltd., who sell their products under the name of 'GaltGlass.' These dome lights are made in rectangular, circular and square sections, ranging from 8ft. by 6ft. rectangular, to 2ft. 6in. by 3ft. rectangular and in circular up to 8ft., in square up to 4ft. square. These dome lights are an effective means of admitting daylight in a diffused form and are shatterproof and therefore ideal for use in schools and other buildings where safety factor is important. These dome lights are also of very real interest within the field of industrial chemicals where fume and smoke are in many instances corrosive.

Siemens Ediswan Ltd. had on show perspex panels 12in. by 24in. for light diffusion. These panels are made of the same dimension as the steel acoustic tiles with which they are fitted. Also on show was a new design of lightweight telephone made from high impact polystyrene.

Next week's continuation of this report will cover rubber industry contributions and further plastics exhibits.

New Enamel

A new one-coat stoving enamel, claimed to increase productivity and cut production costs, is now being manufactured by Lewis Berger (Great Britain) Ltd.

The new enamel, 'Bergercron,' based on acrylic resins, is said to be harder and more flexible, to resist heavy impacts, acids, stains and corrosion, and to be suitable for domestic appliances such as refrigerators, washing machines and cookers, as well as office furniture.

Tebrau Rubber Estates is raising its dividend from 10% to 25% for the year ended June 30 1959.

Rubber Technology

RUBBERS FOR SERVICE AT ELEVATED TEMPERATURES — PART 3

By 'CROSSLINK'

WHEN service temperatures approach and exceed 200°C. and extended life of the rubber component is a prerequisite, the number of elastomers on which we may choose to base our compound is much reduced in number. Most organic rubbers undergo chain scission in the presence of oxygen although this can be retarded by the presence of suitable substituent chemical groupings attached to the main carbon skeleton. For example, highly fluorinated hydrocarbon chains show exceptional thermal and oxidative stability and fluoroelastomers are therefore of great interest for service under the most severe conditions. An alternative approach to the problem is to use rubbers which do not contain an organic (in the sense of carbon chain) skeleton and the most successful of these have been the silicone rubbers where the main chain C-C bonds in conventional rubbers are replaced by the more thermally stable Si-O linkages.

Silicone rubbers contain carbon in the side groups substituted along the chains. Methyl substituents are the commonest but partial replacement of these with other groupings may be used to prepare rubbers with specific properties; for example, introduction of bulky phenyl groupings reduces inter-chain cohesion and has the effect of lowering the brittle point of the vulcanized rubber; introduction of vinyl groups enables a more rapid and efficient cure to be achieved leading to lower compression set without the use of toxic additives such as cadmium and mercury compounds. Rubbers containing relatively large proportions of vinyl groups have been prepared and these are compatible with organic rubbers and may be cured with sulphur although the properties of the blends do not always combine the virtues of the constituents.

Curatives

The more normal curatives are organic peroxides. In vinyl substituted polymers, dicumyl peroxide is one of the most used materials on account of its flat curing characteristics, particularly where it is necessary to cure thick sections of rubber; in non-vinyl containing rubbers, a more powerful peroxide such as benzoyl or its chloroderivative is required and it is often necessary to cure the rubber in two stages, a 'set cure' in a press followed by a long hot air cure in an oven during which hydrocarbon chains forming the original cross-links between the main chain silicon atoms are slowly replaced by oxygen. This results in high shrinkage of the rubber but it is necessary in order to make full use of the high Si-O bond strength as reflected in the excellent maintenance of the rubber's properties during exposure. Fillers and other additives have to be chosen with care in order that they shall be themselves thermally stable and to avoid any possibility of decomposing the peroxide curative. Special grades of silica are the preferred fillers for high mechanical strength but iron oxides, titanium dioxide and in some compounds zinc oxide are all of value. Pigments are preferably inorganic in nature. Plasticizers should normally be avoided unless silicone oils or greases are used which can be vulcanized into the structure during cure.

Silicones

Disadvantages of silicone rubbers with respect to their organic counterparts are poor mechanical properties, poor oil resistance, high cost, generally more difficult processing. However, great improvements have been made in recent years, the most recent being the introduction of oil-resistant silicones containing fluoro- or nitrile groupings; the latter have not yet become available in this country but in view of the very high price and difficult processing of the current fluoro-silicone (LS53), the advent of the new material is awaited with the greatest interest. Vinyl-modified silicones will generally stand up to continuous service at 200°C. while the methyl rubbers operate well at temperatures up to 30 to 40° higher.

While silicones stand up well to most chemical attack, exposure to steam, certain strongly swelling solvents and chemicals will cause deterioration and it is under these conditions that one must seek alternatives. The fluororubbers have been introduced to fill the bill but only at considerably greater cost even than the silicones. Their physical properties, while often satisfactory when measured at room temperature, fall to quite low values when measured at the higher temperatures of service. As an example, some work of Smith (Firestone, USA) published in the *Rubber World* last year, gives the tear strength of a compounded and vulcanized proprietary fluoro - rubber which has been widely advertised as 179lb./in. at room temperature but only 23lb./in. at the quite moderate temperature of 150°C. (Corresponding figures for an NR black stock were 864lb./in. at room temperature and 311lb./in. at 150°C., although it must be borne in mind that the latter figure would deteriorate fairly rapidly with time of exposure at the high temperature.) At 205°C., the tear strength of the fluororubber had fallen still further to a figure of 4lb./in., probably hardly sufficient to strip it from the mould without damage if the supplier's high temperature curing recommendations are followed. In fact, this general weakness in rubbers which otherwise show excellent stability of properties on long exposure at high temperatures is probably their greatest drawback and much development work is being expended on them without any striking advances having yet been reported. For service in compression in such applications as resilient seals and gaskets the position is happier, and whereas the US Government reported last year that tests on seal rubbers immersed in hydraulic fluids showed that only two commercial elastomers remained serviceable at 205°C. and none at 288°C., it has since been reported that a development rubber, Fluorocarbon Elastomer 214, should show superior performance. Its suppliers claim continuous performance at 260°C. or a limited number of short exposures at up to 315°C.

Future Developments

While we have been concerned so far with the development of rubbers on a commercial basis, it would appear that the limit for useful service of our present-day rubbers is set at some temperature below 300°C.

However, in the near future this modest limit may be greatly extended both by the introduction of highly-fluorinated polymers of 'semi-organic character' and by the development of new polymers based on silicon, phosphorus, boron, tin, aluminium, titanium, and other metals. Laboratory reports suggest that materials

such as the perfluoropolyphenyls, while poor in physical properties, show potential thermal stability at temperatures up to nearly 500°C. Several investigators have reported on the polymerization of phosphonitrilic chloride ($PNCl_2$) which is available commercially in the form of cyclic oligomers; present results indicate good thermal stability of the high molecular weight rubbery polymers up to at least 350°C., but difficulties exist on account of the rapid hydrolysis which occurs under damp conditions.

Some of the most interesting developments have been reported from Russia where Andrianov and others are pressing the analogy between the structure of ceramic materials such as Corundum and highly cross-linked semi-organic polymers such as the silicone resins. Here the refractory properties which we prize so highly are obtained at the expense of complete insolubility and infusibility; solubility is a question of the introduction of a controlled number of substituent organic groupings into the chain structure and infusibility should result from the introduction of cross-links between chains in an ordinary vulcanization process. Promising results have been obtained using Al-O and Ti-O skeletons, although it appears that no polymer has yet appeared which is suitable for technological evaluation.

Threadbare Picture

Regrettably, while other countries forge ahead, the effort being expended on high temperature polymer research is, as usual, inadequate in the UK not forgetting the excellent background investigations on fluorinated compounds carried out by Professor Stacey and his collaborators. In Russia and in the USA, polymer research and technology is properly recognized as a fundamental subject and forms part of the undergraduate course at many universities and colleges. While it must be admitted that we were the first in this country to endow a college purely for the teaching of polymer technology, the overall picture is a bit threadbare, most university departments regarding it as sufficient to relegate the subject to half a dozen lectures at the end of the honours chemistry course on free radical mechanisms. The stimulus of rocket research has led to an increased demand for the ultimate properties of organic materials and it is time that industry spent a little time and money going into the planning and financing of a properly co-ordinated and widely-spread research programme. The smug belief of many boards that their hard-pressed development and technical service laboratories are, in fact, contributing to this work will no doubt erect a temporary barrier to real progress but it will only require a few companies to sink their money in polymer research fellowships at universities and colleges in a big way in order to set the pattern of research which must be of enormous benefit to the industry as a whole in the not-too-distant future.

Plastics in Building

LONDON CONFERENCE

(Concluded from November 28 issue, page 694)

Thermal Installation

An interesting paper on thermal insulation was delivered by W. B. Brown, Ph.D., B.Sc., D.I.C., A.R.C.S., A.R.I.C. (Senior Department Chemist, Monsanto Chemicals Ltd.). The physical, mechanical and thermal properties of expanded forms of polystyrene, polyisocyanate, ebonite, urea formaldehyde and phenol formaldehyde were outlined and their main properties compared with those of conventional insulating materials. The plastic products were compared one with another in detail. The uses of foamed polystyrene in building were described, fixing methods and problems were discussed and the use of the product in conjunction with concrete was described. The influence of bulk density upon the physical properties and the reaction of the product to static loadings was discussed. Modifications of the product leading to new possible uses were also suggested.

Performance and Aesthetics

Performance and aesthetics were considered in a paper by G. K. Findlay, L.R.I.B.A. (Consultant Architect, Unity Structures Ltd.).

Plastics had come to stay and the use of plastics in the building industry was a challenge to the architectural profession, but this paper also underlined the necessity for co-operation by the plastics industry.

The architect's thoughts must be divorced from the conventional approach and applied to a study of the characteristics of plastics and their fabrication techniques. It was then found possible to produce designs which offered luxury at a reasonable price or were economic by reason of their double duty functions or convenience of installation. Sheer substitution of the conventional would rarely achieve the desired results.

Various examples were given to emphasize the author's viewpoint. Plastics baths had copied the cheapest cast iron designs when luxury baths would have been no more expensive. Furthermore, deficiencies in design could be eliminated by taking advantage of the properties which new materials placed at the designer's disposal.

It was shown how a cleverly designed polystyrene wall panel could offer much more than a simple reproduction of a conventional tile; much greater colour possibilities, a luxury appearance, design features giving strong and simplified fitting and the extra decorative feature of controlled jointing.

Plastic window frames were being evolved for external use but where substitution of conventional materials was expensive, a partnership of the old and the new was described which offered greater advantages than either could provide separately.

Gutters offered a tantalizing target, but this was also an example of misapplication when copying conventional products. A new design of gutter demonstrated how constructional and other savings could result from the comprehensive evaluation which was essential to the proper use of plastics.

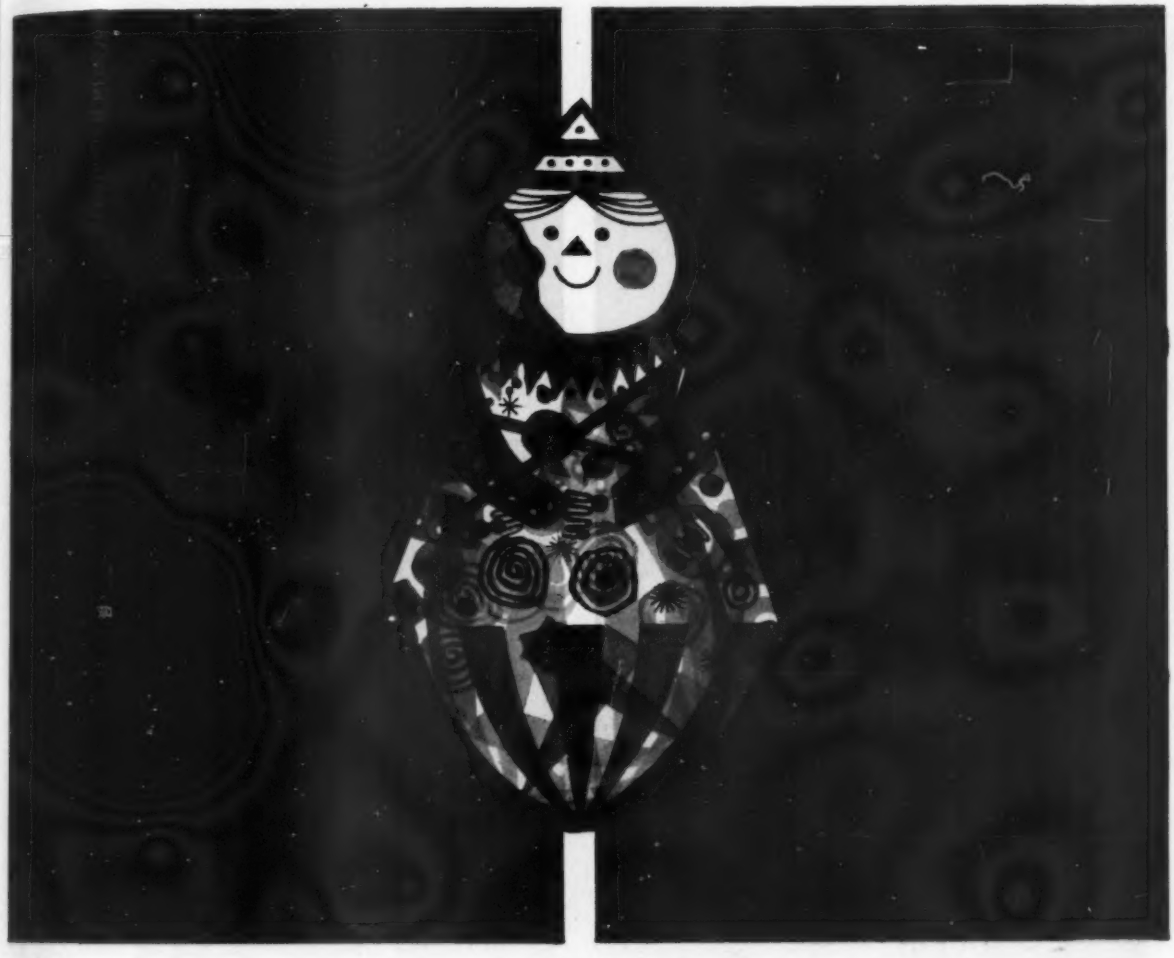
Everywhere there was an awareness of the part which plastics were destined to play in future buildings but these thoughts had been nowhere better crystallized than in the world-famous experimental house—'The Monsanto House of the Future' and the paper concluded with the showing of a colour film describing this advanced experiment.

Stockpile Sales

Sales from the Board of Trade's stock of natural rubber in November totalled 8,807 tons, for delivery as follows: Spot, 874 tons; December delivery, 1,643 tons; January delivery, 3,990 tons; February delivery, 2,330 tons. Stocks at the Board's depots at the end of November, including rubber sold for forward delivery, amounted to 89,803 tons.

The US General Services Administration has announced that sales of crude natural rubber from the US national stockpile totalled 6,854 long tons between November 2 and November 30 1959.

Stabilised



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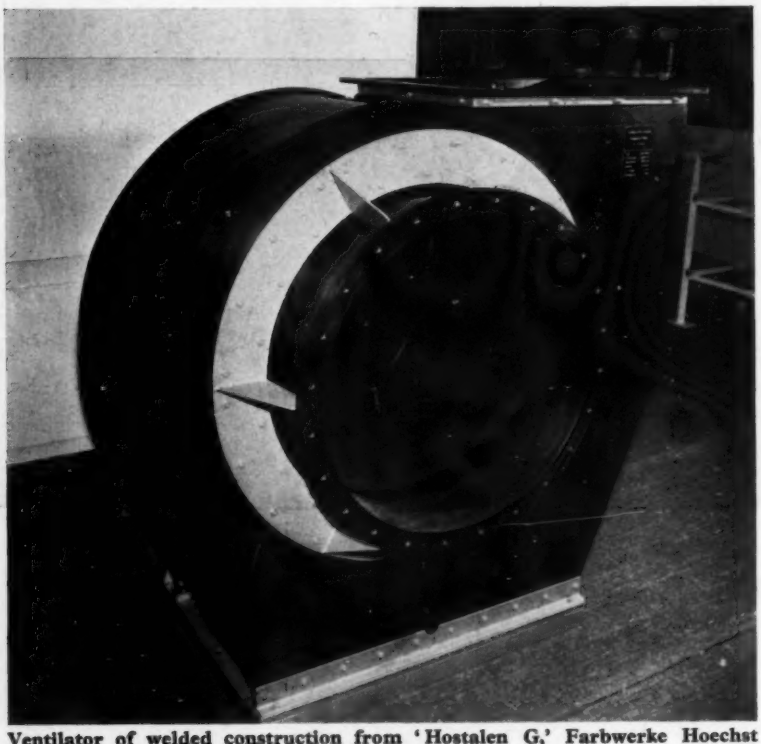
SIXTH REPORT—COMPREHENSIVE RANGE OF MATERIALS

PREVIOUS reviews of the Düsseldorf Plastics Exhibition in the journal have been concerned in the main with some of the machinery displayed and end-uses of plastics materials. The range of plastics raw materials exhibited was probably the widest yet shown on a single occasion. Ten companies showed polycarbonates, mostly in pipes or foils although Farbenfabriken Bayer showed some of the raw material from which, although still developing, a fairly wide range of products from



Ventilator of welded construction from 'Hostalen G,' Farbwerke Hoechst polythene

electrical and industrial to household goods is being manufactured. That Makrolon is suited to these products, and to many others, is indicated by data published by Bayer which include high mechanical strength over a temperature range from well under −100°C. to +135°C. dimensional stability and good transparency. The foils, Makrofol N and Makrofol G, illustrate the electrical properties as well as temperature resistance. They retain their dielectric properties almost unchanged from −40° to +130°C. Makrofol G is a stretched foil available in thicknesses down to 10 microns.

Polypropylene products and raw materials were shown in considerable variety with the accent on household goods, but there were also some interesting films and foils and increasing uses of this versatile material with its known properties of lightness, strength and good heat resistance. The raw materials were shown by Chemische Werke Hüls (Vestolen P), I.C.I. (Propathene), Shell International Chemical (Carlona), Farbwerke Hoechst (Hostalen PP) and, of course, Montecatini (Moplen).

Polyvinyl chlorides and PVC copolymers were shown in tremendous variety on a great number of stands, ranging in end-uses from rigid pipes through to window frames, packaging foils and expanded products. Over 40% of the annual production of PVC in Western Germany comes from Chemische Werke Hüls—it is made there both by emulsion and suspension polymerization—who showed a wide range of their Vestolit grades including granulates, pastes and dispersions. Shell exhibited a full range of their PVC emulsion polymers, while the Hostalit Z grade of Fabwerke Hoechst aroused interest. This is a modified unplasticized PVC distinguished by good impact strength even at low temperatures and suitable for vacuum forming. Techniques are being developed for producing corrugated sheets from this material. Of interest from the chemical engineering aspect were the vinylchloride-vinylacetate copolymers, designed to resist most chemicals, which were shown by Montecatini.

The Plastics Division of I.C.I. showed their Darvic PVC for extrusion, sheet, dipping, etc., and there was emphasis on the use of Corvic for conveyor belting in mines. Bakelite Ltd. exhibited Vybak PVC in representative mouldings. British Geon displayed a number of applications including pipes in high impact PVC, foams for insulation and upholstery, tiles, sheet, etc. Dynamit AG featured on their stand an attractive 'plastic house' containing a number of the company's products including PVC which was shown in different varieties and forms as, for example, extruded over metal window frames, as flooring and wall decoration, as upholstery—including PVC foam—and Astralon T, an interesting PVC copolymer well suited by reason of its properties to the deep drawn vacuum forming of refrigerators.

Polythenes, high and low density, and polythene products were to be seen on more than 50 stands. Foremost was I.C.I.'s Alkathene of which more than 90,000 tons a year is at present produced, although Badische Anilin- und Soda-Fabrik claim to have the widest range of polythenes in Europe. Accent here was on the Lupolen grades, most of which are produced by Rheinischen Olefinwerke, Cologne, a jointly owned subsidiary of BASF and Deutsche Shell. Output of Lupolen, presently about 40,000 tons a year, is scheduled to rise to some 120,000 tons a year by the end of 1962. Incidentally, the BASF stand was made entirely from plastics materials made by the company.

One of the few materials shown for the first time was polyvinylcarbazole, a BASF product. These polymers, which are available in form varying from powder to lumps, can be com-

Demonstrating something of the temperature range covered by 'Makrolon,' Farbenfabriken Bayer's]polycarbonate (*Photo by Bayer*)

pression moulded (about 340 to 460°F.) and injection moulded (about 430 to 600°F.), the temperatures depending upon the degree of plasticization.

The increase in the use of polythene for packaging in Germany was emphasized by the number of exhibitors who showed films and foils. There were naturally representative articles from most of the innumerable kinds made from polythene. Among others who showed polythene products were Montecatini, Bakelite, the Union Carbide Corporation and Omni Products Corporation from the US, and Farbwerke Hoechst who showed the laboratory plant for the production of polythene from ethylene gas, which was such a success at the Brussels World Fair, alongside examples of their Hostalen. Mention was made on this stand of developments of new techniques, notably the recently announced biaxial orientation process by which, because of a consequent increase in strength, it is said to be possible to reduce pipe wall strengths by 50%. Vestolen A, Chemische Werke Hüls high density polythene, was among the 28 products (out of more than 500 produced) shown on that company's stand. A selection of end-products made from Rigidex high density polythene was displayed on the stand of British Resin Products.

Apart from other established up-and-coming and newer raw materials —the list, already long, grows almost daily — a number of foam products were on show. These included foamed polystyrene and rigid and flexible PVC foams whose uses go on expanding as their attractive insulating and buoyant properties become more widely known. The uses of plastics foams in building were also demonstrated. A number of companies showed polyurethane elastomers, both polyester and polyether, rigid and flexible types of which are increasing. Bayer showed details of an interesting processing technique by which combinations of two of their products (Desmophen A, isocyanate-modified polyester and Desmodur TT, dimerized tolulene diisocyanate) can be processed on normal rubber industry machinery.

One of the exhibitors on the combined British stand, Novadel Ltd., showed their interesting range of organic peroxides suitable for the cross-linking of polythene and vinyl resins. This company also featured lead, barium/cadmium and epoxy stabilizers. Omya GmbH, whose UK agents are Croxton and Garry Ltd., in addition to a wide range of products showed two new fillers. One of these, Omya BLR.3, is an inert filler for polythene giving a white colour and a diluting effect up to 100 parts on 100 parts by weight of polythene and the reinforcing filler Omyalen. Also shown was a new white filler, Omya BL.18, produced from pure crystalline calcite and treated with a view to its incorporation in high and low density polythene.

Airbed, records, record player, swimsuit and beach bag in this Chemische Werke Hüls picture are all made from plastics

An interesting use of polyurethane foam, in this case Bayer 'Moltopren,' to decrease the noise level in cars

US Rubber Stockpile Sales

THE General Services Administration has released a current schedule of the quantities and qualities of natural crude rubber available for sale from the national stockpile as of November 30 1959. The announcement states: 'The types and amounts covered by the schedule represent the rubber GSA has scheduled for disposal, not what will be sold during any given period of time. That the amount on the schedule totals 74,083 long tons does not alter the agency's present intention, as announced earlier, to sell approximately 50,000 long tons during the current fiscal year.'

Rubber sold from the national stockpile without replacement from October 16, when the programme began, to November 30 totalled 12,650 long tons. 'In the future, sales figures and quantities available for sale will be announced simultaneously on a monthly basis, shortly after the first of each month.'

The GSA announcement gives the following table showing the total tonnage of rubber available by grade on the current rotation schedule:

Grade	Long tons
1X RSS	32,253
1 RSS	9,003
2 RSS	628
3 RSS	777
4 RSS	346
5 RSS	34
1X thin crepe	3,790
1 thin crepe	11,008
2 thin crepe	1,414
3 thin crepe	203
1X thick crepe	1,130
1 thick crepe	3,674
2 thick crepe	353
Liberian selective	3,656
Liberian regular	1,528
1X thin brown	219
2X thin brown	625
3X thin brown	13
1 thin brown	205
2 thin brown	916
3 thin brown	22
4 thin brown	34
2 amber	95
3 amber	1,304
4 amber	853

Canadian Rubber

The Goodyear Tire and Rubber Co. of Canada Ltd. has announced that retreaded tyres with the same guarantee as new tyres are now available to Canadian motorists. Under a new programme, believed to be the first of its kind in the industry, Goodyear is licensing retreaders who conform to specific standards of material and workmanship. In return, the retreaders are allowed to brand their retreads with a special seal.

The customer is guaranteed that his retreads are 'free from defects in workmanship and material without limit as to time or mileage,' which is the same basic guarantee covering the company's new tyres. Because of recent advances in tyre and tyre cord construction, modern tyre carcases are capable of giving many times more mileage than is provided by their original tread, Goodyear says. Truck lines, taxi fleets and bus lines have been major retread customers for many years. Savings vary according to the size and type of tyre, but Goodyear seal retread cols cost as little as half as much as a new tyre.

Mr John M. Gullick and Mr Arthur E. Scott have been appointed to the Board of KMS (Malay States) Rubber Plantations. Sir John Hay, Mr Keith M. G. Anderson and Mr Daniel O. Wright have resigned.

PLASTICS INSTITUTE NEWS

The Earl of Verulam will deliver the Eleventh Annual Lecture of the Plastics Institute on the subject of 'The Brink of the Unknown.' The meeting will be held in the Reardon Smith Lecture Theatre, National Museum of Wales, Cardiff, at 6.30 p.m. on Thursday April 7 1960.

The next Plastics Institute examination will be held from 13-18 June 1960.

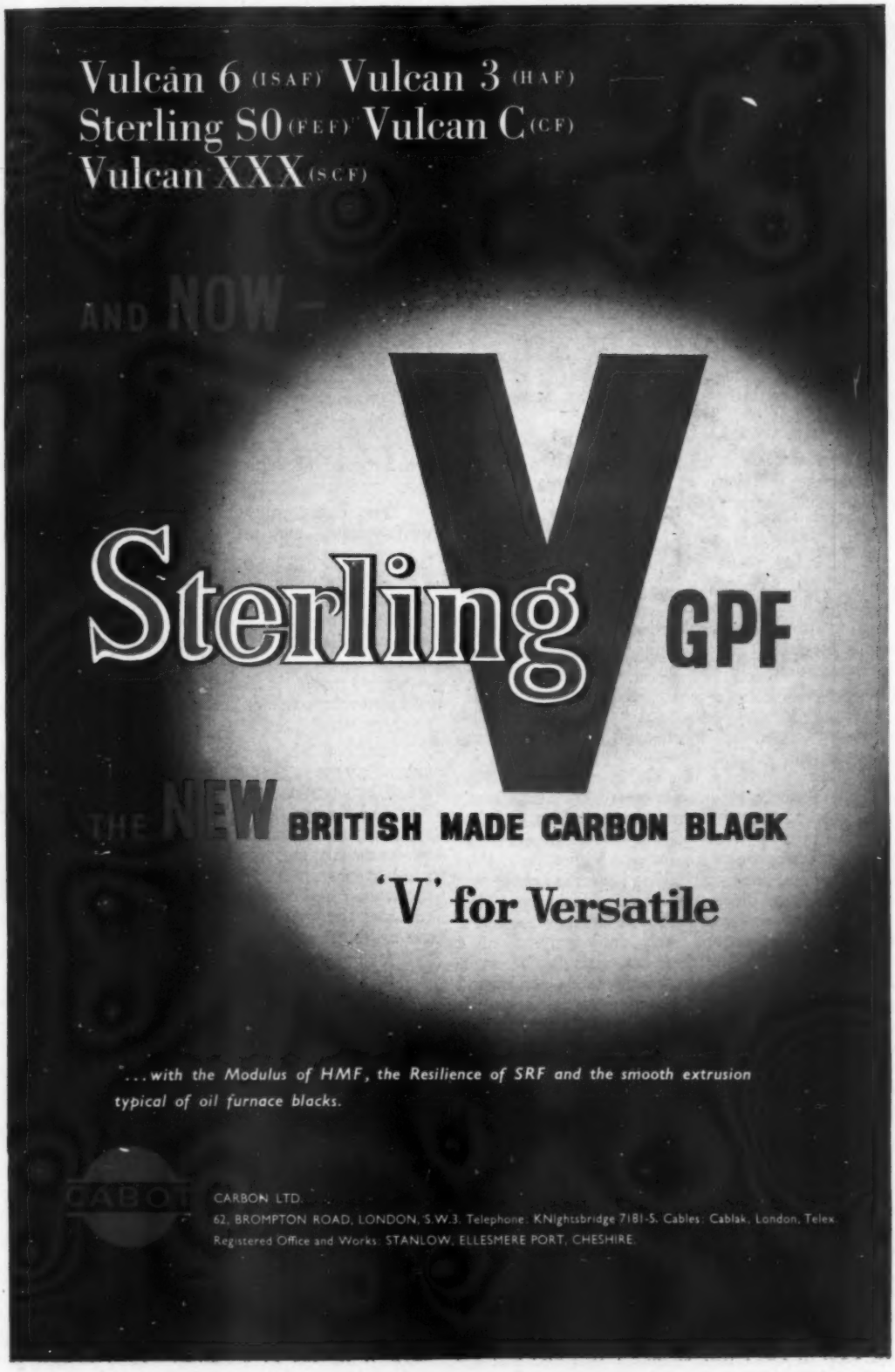
Fellowships and Associateships

The Council has elected the following: Fellow: A. Lewin, B.Sc., A.R.I.C., A.P.I. Associates: D. R. Bannister, M. R. Eisner, B.Sc., J. Foster, A.I.R.I., A.N.C.R.T., R. E. D. Fox, J. Pritchard, A.I.R.I., A.N.C.R.T., D. K. Taylor, A.R.I.C.

Education

The inaugural meeting of the Education Discussion Circle was held at Brunel College of Technology, Acton, on November 26, when the subject of the Institute's requirements for practical course work were discussed by 25 teachers from seven colleges providing courses in plastics technology.

Against a background of the Amazon, 3,000 miles from the sea, a Firestone Tire and Rubber Co. 1,000-gallon rubber-coated nylon 'Fabritank' is carrying diesel fuel to a gold dredging concern currently working in one of the most inaccessible sections of the river. The transportation of fuel by this method has cut the dredging company's fuel costs by 80%. On its journey the tank is accompanied by two natives on a balsa wood raft; no power is used to drive the tank which is set adrift in mid-stream and allowed to pursue its own course, often including rapids and rocky areas. When it has been emptied at the dredging site it is rolled up and flown back to the fuel depot. So successful have been the dredging company's experiments with this first 'Fabritank' that two more have been ordered for immediate delivery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VIEWS and REVIEWS

Road Research Today — for Better Roads Tomorrow

A CONDENSATION of an address delivered by Ellis L. Armstrong, US Commissioner of Public Roads, at the 62nd *ASTM* Annual Meeting, serves to place various materials in which we are interested, in their rightful place—the word rightful is here intended to be in the numerical, or rather financial sense, and not in potential significance. (*ASTM Bull.* No. 241, p. 14.)

To render the matter the more important the Commissioner commences by calling our attention to the construction costs: Materials and supplies represent nearly 50% of construction expenses. 'In this year of 1959, some $2.7 billion (*Note:* An American "billion"=1,000 million) will be spent on steel, cement, bitumens, lumber, aggregate, pipe, petroleum products, explosives, paints . . . all of them measured in thousands or millions of pounds, tons, gallons or feet.'

He suggests that with such staggering quantities involved it is essential that we improve existing materials and develop new ones; always with the goal of increasing both quality and economy.

It is true that the quantities used in the United States are no measure of our own, but the bill, if less staggering, is still very large.

After dealing with *Soils*, our author deals with *Bituminous Materials*, because a consideration of flexible roads directs attention to them. Bitumen in some form or other has been used as a waterproofing material since the Pharoahs. And here we come across a difficulty. 'Current methods of test are empirical, and specified properties of the materials are based on empirical relations. No major developments towards improved bitumens or better techniques for their use are likely until truly scientific relations of the properties of these materials can be established.' . . . 'We want to know the absolute viscosity and the changes that occur in this viscosity with temperature or pressure. The hardening of asphalt with age and its effect on pavement (*i.e. road*) properties must be determined. . . .'

And here there is a reference to the progress in petrochemicals and plastics fields to realize what can be done. Thus lubricating oils are modified or treated with additives to increase their efficiency and resistance to heat. In the plastics field a wide range of materials has been developed to meet an equally wide range of needs. Thermosetting materials, for example, make use of a curing agent or catalyst to produce a hardened resin which after curing, will not soften with heat.

Such developments are easily within the realm of possibility—yes, even probability—for bituminous highway materials. . . . Although the costs of specialized materials that might be developed may seem prohibitive, we must keep in mind that volume production and experience can in many cases eventually reduce the cost of new or improved materials to a point below the cost of the original 'natural' materials.

Rubber

The Commissioner then proceeds: 'Actually, some progress is being made. The use of rubber and other high polymers as a blend with asphalt to improve its properties is being tested on a broad scale. More recently, the admixture of resins with asphalts to provide a tough, resilient product for special applications has been accomplished. Quite a number of additives now on the market are designed to improve the adhesion of the asphalt to stone and to prevent damage from water.

'True, many of these claims for these materials are controversial, and a carefully planned program of research is needed to weed out the fact from the fancy.' And again:

'The use of epoxy resins for joining new and old concrete and for cementing anti-skid coatings to existing pavements is a new and successful, but rather expensive development. Research is warranted to develop less expensive materials with the same properties, or to extend or improve the use of the epoxies in order to obtain less costly repairs.'

That, I think, gives a broadly correct view of the improvements in asphalts by means of rubber and plastics. I refrain from dealing with the section in the paper on *Portland Cement*. I wished to touch only on the methods suggested by the Commissioner on the asphalts as being the materials most suitable for admixture with rubber and the plastics. It will be appreciated that so far the results, by and large, although very hopeful, are—if we consider the vast volume of material employed—still in the experimental category.

A New Idea

Industrial and Engineering Chemistry in its October 1959 (*Vol. 51*, No. 10), strikes a 'New Idea in Technical Journalism,' which serious minded readers will do well to ponder on seriously. Any serious attempt to counteract the evils of excessive specialization is to be welcomed. In these days of specialization, we are prone to overlook its drawbacks in the contemplation of its advantages. You cannot do better than read what *I/EC* says:

'Three years of survey research into the reading habits of technical people have revealed to the editors of *I/EC* that there is in the Chemical Processing Industries today . . . A SERIOUS READING CRISIS.'

'*This reading crisis is characterized by:*

'1. *A trend toward specialization* which leads you away from the general, to the more specialized journal.

'2. *A decline in browsing.* Even though you want and need fringe literature benefits, you haven't found them in specialized journals.

'3. *A need to improve the efficiency of the time you*

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **DR SCHIDROWITZ**

spend on reading. You want to cover more subjects, in fewer words and less time.

'To solve this READING CRISIS, WE KNOW YOU NEED . . . .

(Here follows the answer of *I/EC* to the above. It would not be fair to *I/EC* to reveal their reply. You should study it in the original.)

RRIM 1957

Continuing their policy of bringing their annual reports to date the *RRIM* have now reached the year 1957, and the Annual Report for 1957 has just come to hand.

One cannot expect to review a report other than for the past year as fully as the immediate past 12 months, but it is not well to assume that the reports for the years that have passed (other than the last) contain nothing of value. Indeed, the reverse may well be the case. It is with this thought in mind that '1957' has been considered.

The following then has been taken from the *Report* of the Director for that year, and for various reasons has been confined to the *Chemical Division.*

Microbiology of Latex

The application of bactericides to rubber trees has led to some interesting observations, which are being actively followed up. Earlier work had demonstrated that the tapping cut of a tree in normal tapping is heavily infected with bacteria. It has now been shown that by treatment with powerful bactericides, additional flow of latex from the tree is obtained. The effect is thus one of stimulation. The properties of the latex are also improved by virtue of a lower degree of contamination.

Polymer Chemistry

Work with fresh latex has confirmed the greater chemical activity of fresh latex on emerging from the tree compared with that noted after shipment of dry rubber. Deliberate aeration of latex induces considerable peroxidic activity of the hydrocarbon which can then be directed towards carbon-carbon cross-linking and hardening of the rubber or towards molecular chain scission and softening. Peroxidic activity of aerated fresh latex initiates polymerization and leads to the ready formation of graft polymers, having different properties from those of grafts prepared after shipment.

Foam Experiments

Work on establishing results for the suitability of latex concentrates for foam rubber production has continued, and it is interesting to record that for satisfactory foam preparation the formulation had to be changed for some of the latices, confirming variability in this regard. No correlation between chemical analysis and foam making property could be established by analysis.

Reducing Variability

Further work has confirmed earlier observations that certain basic constituents of late play an important part in controlling vulcanization behaviour. The present work has indicated a simple means of assaying these constituents which could possibly be applied to normal estate production in order to control properties. These studies form part of a programme of preparing dry rubber by a continuous process with a view to reducing labour charges, at the same time leading to greater technical control in order to obtain a more uniform product.

Technical Control

Work has been carried out on a new specialty rubber developed at BRPRA. This material retains its rubbery character at low temperatures, by virtue of its non-crystallizing character. Production in the UK has involved the use of twice centrifuged latex, owing to certain inhibitors present in latex serum which interferes with the preparation. Attempts to produce the rubber more cheaply have already met with some success and further developments are now being followed up.

Safety First

The Firestone Tire and Rubber Co. Ltd. of Bombay has been awarded the National Safety Council's highest recognition, The Award of Honour, for completing 6,679,236 injury-free man-hours. The plant has worked 23 months without a lost-time injury, and thus set what was said to be the world's safety record for industrial goods plants. The award was made by the Minister for Labour and Law, to the chairman of the Bombay plant's safety committee. Under the same award plan Firestone's Buenos Aires textile plant received an Award of Merit, second highest award, for its outstanding performance in 1958. Employees at this plant worked more than 1,580,000 man-hours without an injury. Under the same plan Firestone's Brentford, England, plant was recognized for its safety performance in 1958. This plant also received the Award of Merit on the basis of a 68% improvement on the firm's accident frequency rate for 1958 over a previous three-year average. Employees achieved a frequency rate of 0.57 last year, as compared with the rubber industry average of 2.1 (*Rubber World,* October 1959, p. 10).

Stimulation of Tree Yield

Referring to my review under the above heading in the issue of November 28, it is evident that, as originally printed, the last sentence is entirely out of keeping with the remainder of my review. It is clear that what has happened is that the word 'not' has been transposed. This would mean that the last sentence should have read:

'It is plain that under present conditions the use of these stimulants is advisable. Under others, their application is unlikely to be successful.'

I think I may add that the term 'present conditions' was inadvisable, and 'most' or 'some conditions' would have been better, as reproducing the interpretation of the writer of the article in the Planters' Bulletin.

Firestone Nylon

I regret that the word 'nylon' was omitted in the second line under 'Notes' of December 5 1959, which should read: 'Firestone Tire and Rubber Co. will be the first American rubber company to produce its own nylon filament yarn for tyre cord. . . .'

PHILIP SCHIDROWITZ

Questions Corner—95

(Second Series)

399. What are the main features that need to be considered in the moulding of polyester premixes?

400. Give some details of the types of plastic sheet and film that are used for linings of tanks, containers, etc.

401. What are the advantages of using cold curing epoxy based adhesives?

402. In injection moulding what effect have the particle size, shape, etc., of the granules on the process?

(Answers next week)

Answers to Questions Corner—94

395. Liquid coatings used for tank linings fall into two groups, *viz.*, thermoplastic and thermosetting. In the former group vinyl type coatings predominate, particularly polyvinyl chloride and copolymers, vinylidene chloride and acrylonitrile copolymers and low molecular weight polyvinyl chloride resins.

Coatings from thermoplastic materials which do not readily dissolve in common solvents at normal temperatures, such as polythene, may be applied by flame spraying technique.

PTFE dispersions are available in two forms (a) a high viscosity type for dipping and brushing, and (b) a low viscosity type for spray applications. Both contain 40% solids and a minimum thickness of 0.010in. thick is recommended for full protection.

Phenolic coatings of the baked-on and cold-setting types are, of course, thermosetting coatings and they can be applied by conventional methods.

Epoxy coatings are a comparatively recent development in the protective coating field, and here again, baked-on and cold-setting types are available.

It should be noted that adequate preparation of the metal base is essential for maximum protection and, in many cases, the baked-on type confers better protection than the cold-setting types.

396. There are two general types of plastic materials that are used in the production of repair kits and these fall into two main classes. First there is a mixture of a resin, such as epoxy or polyamide, and finely divided metals, and other fillers, to produce a cold solder type of product which can be moulded like putty on to the part to be repaired. The second class consists of glass fibre mat or fabric with the resin. The fabric is saturated with the resin, polyester or epoxy, containing a hardener, placed in position over the damaged part and left for a sufficient time to harden, usually overnight.

One of the reasons for the popularity of these repair kits is the fact that no elaborate tools are required and unskilled users can make a satisfactory job by following simple instructions.

The repair kits based on metallic powders have found wide application in sealing porous castings, seams in metal ducting, cracked motor car blocks, etc. In the majority of cases epoxy resins are used because of their hardness, machinability, temperature and chemical resistance.

Atomized aluminium powder, in epoxy resins, has been used as a solder for motor car body repairs. The great advantage is that after application it may be finished so that it is difficult to distinguish it from the original surface.

397. It must be understood that it is necessary to control the amount of material which is forced into the mould. Too little material results in an incomplete moulding and too much gives lower pressures in the cavity.

To control the feed of material two principal methods are used, *viz.*, volumetric and weight feed.

With the volumetric feed the granules are allowed to fall from the hopper into a chute which is adjusted to measure the required volume to be dropped into the cylinder in front of the ram. This system is adequate for most work but variation in size, lubrication or build-up of static charges could cause variations in the measured volume.

In the weight feed method, as the term implies, the granules are carefully weighed on an automatic scale and dropped into the cylinder. The weight is not affected by the size and shape, etc., of the granules.

It should be added that with preplasticization, where the plunger of the preplasticizer forces the molten resin into the cylinder, accurate measure of the feed by volumetric means is possible and many of the variables associated with other methods are eliminated.

398. Assuming a two-part adhesive consisting of the resin and a hardener, there is the limited pot-life of the mixed materials. This can be adjusted to a practical point if one adopts three simple rules:

1. Mix no more than is necessary at one time, and no more than can be used in a reasonable period.
2. Use a cool mixture and work in a cool room.
3. Mix the ingredients in a shallow, oversize container, and use the contents from this vessel and do not pour into another container.

The curing of an epoxy resin is a chemical reaction and heat is liberated. Unless this heat can escape it heats the resin still more and curing is accelerated. The problem is to make it easy for the heat to escape and this is achieved by mixing a small volume, in a large container, and the use of a metal container.

Another limitation is that it takes a long time to reach the optimum bond characteristics but, if carefully held while the curing takes place the assembly should prove satisfactory.

Finally, cold cured epoxy based adhesives result in limitations in high temperature service.

If it is unavoidably necessary to store mixed materials this should be done in a refrigerator.

(More questions next week)

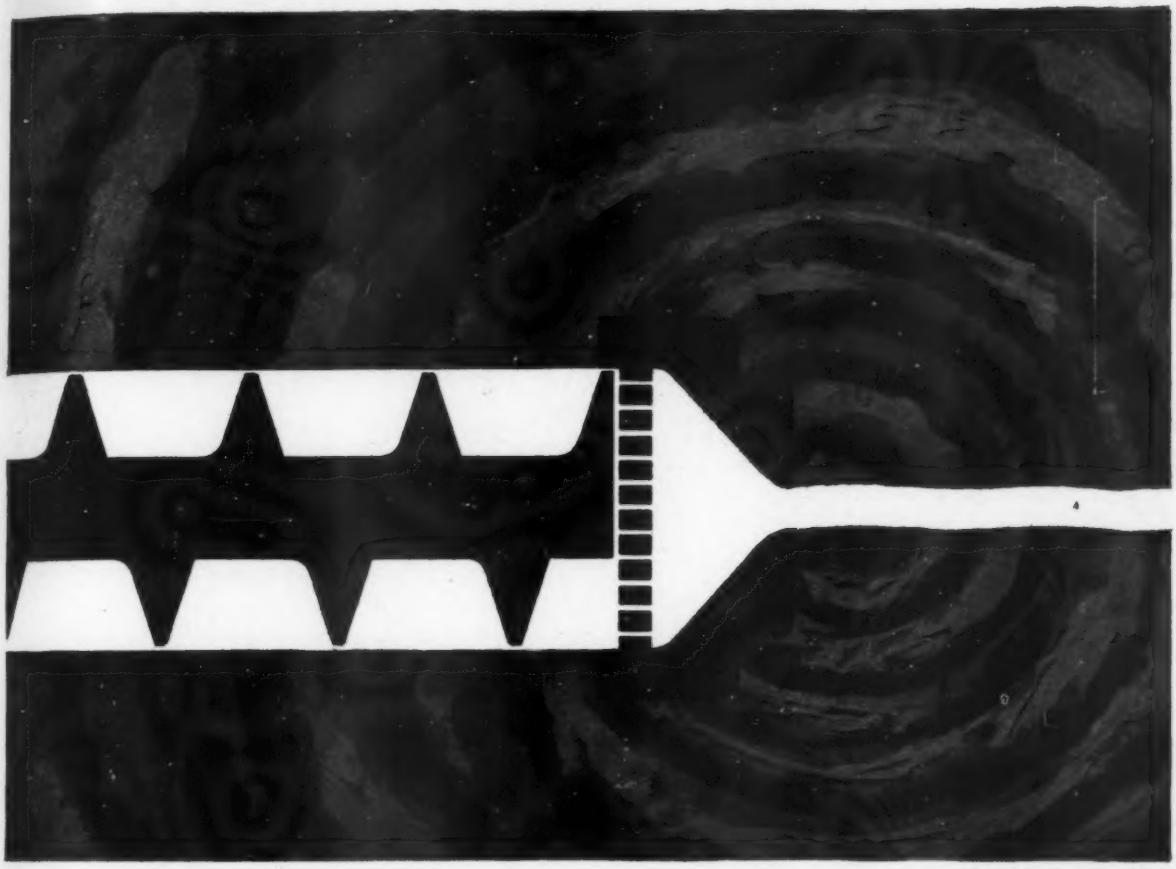
Australian Tyre Plant

The B. F. Goodrich Company's new Australian subsidiary will begin tyre production this month, three months ahead of schedule, according to Mr Willard C. Gulick, president of the International B. F. Goodrich Company. He said tyres manufactured in a new plant near Melbourne will go on sale in Australian markets in March. First production of the new plant will be passenger car tyres, followed soon by commercial and truck sizes. Output will be initially at the rate of 1,100 to 1,200 tyres a day.

Mr S. Moore has been elected a director of Tebing Rubber Estates (1931).

Polly Ester Says . . .

'A Scott Tester—could it be the trews, the whole trews and nothing but the trews?'



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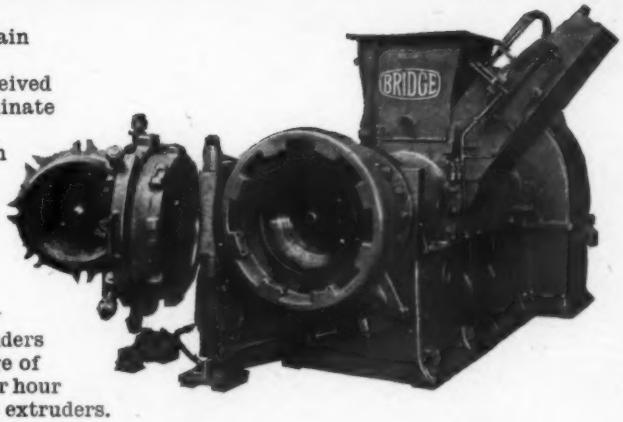

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BELT-CONVEYING COSTS CUT BY HALF AT I.C.I. PLANT

Butyl Rubber covered belt has already lasted 3 times as long as any other—and still no sign of wear

By installing Butyl Rubber covered conveyor belting at their Billingham Chemicals Plant, I.C.I. have cut the cost of belt-conveying phosphate fertilizer by half, and the belting still shows no sign of wear.

WORKING LIFE TREBLED

Owing to the heat of the fertilizer at this stage in the process (*about 115 degrees centigrade*), and the usual damage due to moisture and ageing, even the best synthetic rubber belts used previously have worn out in a year, after shifting about 132,000 tons. A second Butyl Rubber belt was installed elsewhere in the plant three years ago and has shifted 500,000 tons.

COST STILL GOING DOWN

The Butyl Rubber belting is still in perfect condition. And, although it is impossible to forecast its future life, it is expected to reduce the cost of belt-conveying still further.

When ordering conveyor belting it will pay you to specify

Esso Butyl

The man-made rubber with the longest flex life and the greatest resistance to heat, corrosion, ageing, ozone, moisture and tearing. (For handling specially hot materials, Esso Butyl covered belting is even more efficient on a Terylene base.)

Esso Butyl is identical to 'Enjay' Butyl which has established a high reputation in the United States

For information about Esso Butyl Rubber

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MEN and MATTERS

A Review of People and Events

by George A. Greenwood

SOME important changes are occurring in the set-up of O. and E. Kleemann, which apparently involve certain of the directorate. The parent company has sold its subsidiary, Kleeware Plastics (formerly Kleemann Plastics), to Rosedale Associated Manufacturers, the effective date of the sale being at the end of last month. Various internal adjustments follow. For example, it is part of the arrangement that the Rosedale group in the UK and overseas territories will, under certain conditions, buy substantial quantities from the Kleemann group.

Otherwise, the Shell Chemical Company together with O. and M. Kleemann announce the ending as from January 1 of the agency agreement under which Kleemann's subsidiary, Erinoid, markets polystyrene manufactured by Shell Chemicals associate Styrene Products. It is also announced that Erinoid will no longer act as agent for the Ziegler polythene manufactured by Shell, who are to market identical grades of polystyrene under the trade mark Carinex. Erinoid will continue to sell both its own manufactures and grades of polystyrene and polythene.

Among the changes in personnel, Mr Derrick Kleemann has been appointed managing director of Erinoid in succession to the late Mr J. Harvey. Mr L. A. Hygate, secretary of Erinoid, has been appointed a director and general manager of the Stroud factory, and Mr Harry Kleemann, also appointed to the board of Erinoid, has been given charge of polythene sales and public relations.

I.C.I. Retirement

Mr Leonard D. Spurr, rubber chemicals and plastics sales representative of the I.C.I. southern regional sales office, retired on November 30 at the age of 62. He had served the company and its forerunners for 46 years, the last 32 of which were concerned with selling a wide range of the firm's products.

'Len' Spurr, as he was known to his intimates, played an important part in the sales development of the many new materials offered to the rubber industry as its technology progressed with the years and its needs far outstripped any conception of the demand envisaged in Spurr's earlier days. In particular might be mentioned, his pioneering work in connexion with the sales development of polythene and PVC, the establishment of plastics for sheeting and leathercloth manufacture and the introduction of his company's range of synthetic rubbers.

Being a member of the IRI London Section's Committee, 'Len' will not be entirely lost to the industry and his many friends wish him a long and happy retirement.

I.C.I. Plastics Appointment

Mr D. G. Owen has, I am informed, been appointed home sales director of I.C.I. Plastics Division

D. G. OWEN

with effect from January 1. Mr Owen joined the technical department of the Division in 1945. In 1952 he was made division leader of the new PVC Division of the Technical Service and Development Department. Mr Owen was transferred to Sales Control Department as assistant sales manager in charge of PVC products in February 1957 and was appointed manager of Sales Control Department a year later. Educated at St. Albans School, where he was captain of the school, Mr Owen gained an Honours B.Sc. at London University.

A Glasgow Enterprise

Some people are apt to think of Glasgow and Clydeside in terms primarily of shipbuilding and heavy engineering, but an absorbing article in the October issue of 'Scotland,' a publication of the Scottish Council, which a reader has sent me, provides a sharp reminder that this vast industrial area has a good many other absorptions.

This article, headed 'Global Go-Getters," by George Gordon, pinpoints some of the features behind the remarkable export expansion of George MacLellan and Co. Ltd. In a reference to prevailing criticisms of family firms in a world where the financial interests of the joint stock companies tend more and more to prevail, the writer says that this firm has gained nothing but vitality and healthy growth from its strong family connexions.

Established as far back as 1870, he continues, it has been fortunate in having had a succession of leaders who have displayed shrewd sense in widening the scope of their production and who, as itinerant go-getters, have increased the size of their markets many times over. There is not, unfortunately, space enough in which to trace the remarkable growth, over almost a world wide area, of this company, in its practically 90 years of existence, but one or two items do stand out. For example, it was the founder of the firm, George MacLellan, who established the tradition of world travel which has contributed so much to its present success.

At Sydney 80 Years Ago

Mr Gordon says that his products —probably at that time some form of engine packing—were so successful that at the Sydney Exhibition of 1879 where he showed them, they won gold medals. Unfortunately, he died on the return voyage home. In the tradition, production has become more diversified, and markets have accordingly increased, but the most rapid expansion overseas has taken place mainly since the end of the last war. Today, under the chairmanship of Kenneth MacLellan, adds the article, the company sells a wide range of industrial and consumer types of rubber and asbestos products in most parts of the world.

The man most directly concerned with these overseas activities is, by the way, Robin MacLellan, joint managing director with Basil MacLellan, and

if one may judge from its elaborate sales drive in these world markets, there is not a doubt about its future. I like this phrase from Mr Gordon's article: 'The atmosphere in MacLellan's is certainly not one of complacency; it is rather one of continual development and experimentation.' I ought perhaps to add that the description 'family business' does not mean that the MacLellans always come first. 'Todds, Reids, and Alexanders have been with the company since its foundation,' says Mr Gordon. 'For example, David Todd, son of the first works manager, is now on the board and his son has taken over the job of works manager.'

A recent board appointment, too, is that of Mr Sharp Young, who began literally by licking stamps for the company 28 years ago.

Changes and Chances

Following the announcement that Mr Frederick Pearson, who has been for some years a director of British Belting and Asbestos, is to become managing director as from January 1 next, it is stated that Sir William C. Fenton, while relinquishing the latter post then, will remain as chairman. In the spring, Sir William is to give the annual Houldsworth Memorial Lecture at Heckmondwike School. Incidentally, the late Sir Hubert Houldsworth, Bart., chairman of the National Coal Board, and Sir William, were contemporaries at the school.

New Designs in Warerite

The main staircase wall of The Design Centre, Haymarket, London, S.W.1, has been given up to the display of a new range of 'Warerite' (Bakelite Ltd.) laminated plastics including some designed by Jacqueline Groag. The patterns are being shown on eight 4ft. x 2ft. panels. The display will run until about the end of the year.

This is, I am told, the second range of patterns designed for Bakelite Ltd. by Mrs Groag. Her commission in both cases has been to produce a series of patterns which would further extend the uses for the material, not only in the kitchen but in the rest of the house, or for that matter, in hotels, railway carriages, ships or aircraft. The first range was in the main geometric in character; the patterns in the second range are larger in scale, more varied and freely drawn. A number of them are in two or three colours only, one of the most successful is 'Manhattan,' an abstract design in charcoal grey, black and white. Other designs include 'Hedgerow,' a pattern of white sprigs on a grey-blue ground, 'Ravenna,' a multi-coloured mosaic pattern, and 'Calyx,' a design suitable for a nursery or for use on children's furniture.

The following patterns are on show: Manhattan, Hedgerow, Calyx, Ravenna, Metropolis, Eclipse, Alexandretta and Murano.

Erinoid Appointments

Mr Derrick Kleeman, chairman of Erinoid Ltd., has now also become managing director of the company following the recent death of Mr John Harvey. Mr Harry Kleeman joins the Erinoid board as director in charge of polythene sales. He will also be responsible for Kleemann Group public relations and advertising. Mr L. A. Hygate also joins the Erinoid board as director and general manager at the Stroud factory.

These appointments became effective as from December 1 1959.

Wanderers' Meeting

Two Scots-Canadians who worked together for 29 years with the Goodyear Company in Toronto—until one of them went on an overseas assignment in 1952—met again recently at the Wolverhampton plant of the Goodyear Tyre and Rubber Co. (Gt. Britain) Ltd. The reunion came

about when W. N. Ferguson, comptrollers representative from the Goodyear headquarters in Akron, Ohio, arrived at Wolverhampton on a special assignment recently, and found his old friend, N. L. Biddie, was here already conducting a machine accounting survey.

Mr Ferguson, a native of Glasgow, will have completed 40 years' service with Goodyear on February 1. Aberdeen born Mr Biddle has 36 years' service with the organization. Now these two long serving Scots-Canadians are wondering in which country they will meet again next time.

T. A. Wilson

Mention was made in *RJIP* last month of increased production plans by the British Recovered Rubber and Chemical Co. Ltd., of Clayton, Manchester. It may not be generally known that Mr T. A. Wilson, chairman and managing director, has been 32 years with the company.

Mr. Wilson's story is indeed in line with the traditional sagas of industry for he started in BRR as an office boy under the then chairman and managing director who was the father of Mr Garth Swann, now a member of the board. I hear that Mr Wilson who is also chairman and managing director of Arnwest Chemicals Ltd. and Irkdale Industries Ltd., has recently accepted invitations to join the board of two companies outside the rubber industry.

DUNLOP RADIUM CONTAINER

CANCER TREATMENT

As part of the treatment of cancer and other diseases Dunlop are producing rubber ovoids that are now being used as containers for radium capsules by a large number of British hospitals. The ovoids are moulded from black rubber into three different sizes. Each one has a ¼in. hole running down the centre for three-quarters of its length. Into this is inserted a tube of platinum-iridium which is sealed at both ends, and contains the appropriate amount of radium sulphate needed by the particular patient. Two of these ovoids are placed in the body of the patient and are kept firmly locked together by moulded rubber spacer washers placed between them. They remain in the patient for three days and are then removed and destroyed.

Dunlop's latex rubber tubes are used at the same time as the ovoids. The size of tube depends on the length of cavity to be treated. The amount of radium inserted into the tube or into an ovoid is varied according to size, so that the same dose is achieved whichever combination of applicators is used.

Mr F. Pearson, director and controller of British Belting and Asbestos, has been appointed managing director from January 1. Sir William C. Fenton is to relinquish the office of managing director at the end of this year but will remain chairman.

PERPETUAL EMOTION

AFTER a dispute about the wedding presents IXION, son of Phlegyas, popped his father-in-law into a fire-filled pit. Forgiven by the gods, he then made the fatal mistake of making a pass at Zeus's sister. In punishment, Ixion was chained to a wheel which spun perpetually in mid-air. Nowadays it needs a less legendary power to keep wheels working. In industry they need Dunlop transmission belting to drive them. Dunlop conveyor belts, too, are part of the secret of "perpetual motion" in processing and production. Dunlop, in fact, makes all types of industrial belting, each being notable for the necessary flexibility combined with maximum tensile strength and, where required, for fire-resisting properties. This is yet another instance where Dunlop experience in rubber, plastics and fabrics is of widespread service to industry.

DUNLOP *makes things better for everyone*

CPH/PRESS/17

New Catalysts for Polymers

COMPLEX INORGANICS

By PETER BALDWIN

A review of principles underlying polymer catalysis and a 'trailer' of further advances

WHAT makes plastics what they are? Recent developments in the field of fundamental polymer research have promised not only a completely new range of plastics *e.g.* polypropylene, which is, of course, already well established, but have also provided a method through which we may yet come to a complete understanding of the basic behaviour of plastics materials. No longer will plastics research have to depend on more or less empirical methods, but materials will be designed whose very atoms will be arranged to further their intended uses. These methods are based on finding out the way in which catalysts promote polymerizations.

Catalysts promote or make possible a chemical reaction by taking part in one or more of its stages, but once these stages are completed the catalysts do not take part in any further reaction and they can be recovered unchanged at the end. The use of catalysts made possible the controlled reactions that produce plastics, the introduction of new raw materials and the partial discovery of the basic processes of plastics.

Let us now briefly examine how catalysts promote the formation of molecular chains from small molecules, the monomers.

Elimination Polymerizations

From one type of polymerization come the phenolics, the melamines, the polyesters, alkyds and epoxides. The polymer is built up from the monomer units in a large number of clearly defined steps and at each step a small molecule is eliminated. The small molecule can be water, ammonia, hydrogen chloride and so forth. A monomer molecule, capable of reacting at both ends, obtains a negative charge from a catalyst molecule by taking an electron from it. This charge induces an equal and opposite charge in an identical monomer molecule and the two combine. During combination a third, smaller molecule is eliminated. This reaction now takes place at the ends of the newly formed molecule. The final result is a long chain. This can be attached at several points to a number of similar chains through bridges formed usually by oxygen atoms.

The action of the catalyst is twofold in this process. It helps to start the reaction by transferring an electron to the monomer molecule and it clears away the eliminated small molecules by reacting with them. Sulphuric acid, alkalis and metal oxides are catalysts used for elimination polymerizations.

Condensation

PVC and polythene are examples of plastics produced by another type of polymerization. In this case the monomers combine to form long chains without the elimination of small molecules. There are two types of catalysts used: metal halogen compounds which have a great affinity for electrons, and free radicals, short lived molecular entities possessing an unstable electronic structure.

The metal halogen molecule receives an electron from a monomer and combines with it. The end of the molecule containing the metal atom becomes negative and the other end, since electrical neutrality has to be preserved, positive. The positive charge travels along a great number of monomer molecules, and, in the same way as the negative charge in elimination polymerization, it induces chemical combination. Eventually the long molecule chain rearranges its hydrogen atoms and destroys both charges.

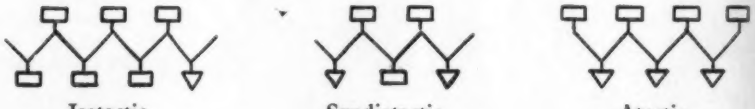
Alternatively, free radicals, obtained generally from peroxides or per-acids can be used to catalyse this reaction. This time the monomer combines with a catalyst and becomes negatively charged, the charge, or electron, travelling along a number of monomer units. The reaction comes to an end if two polymer chains collide, or a charge carrying end of the polymer chain comes into contact with a catalyst molecule or some impurity. In all such cases the juxtaposition of free electrons result in the formation of a chemical bond, which is no longer active and so stops the reaction.

Stereospecific Reactions

The disadvantage of the polymerization reactions just described is that the monomer molecules link up in a random way. This leads to uncertainty about the chain length, the arrangement of monomers in the chain and the connexions between the chains. The density and a number of other physical and chemical properties of the polymer can only be found by making it. However, by using new types of catalysts these uncertainties may in time be eliminated.

Polymer chains can be put together in three possible ways as shown below.

One can see that isotactic polymers have the most ordered structure, the different groups being arranged on two sides of the chain. In syndiotactic polymers the groups are arranged in an orderly manner on two sides of the chain, whilst in atactic polymers the groups are at random. The amount of order in each case is different and therefore the properties of the final polymers are also different. Thus among the polyolefins only the isotactic ones can crystallize.



Isotactic Syndiotactic Atactic

Ordinary polymerization reactions give a mixture of all three geometrical varieties, but if the new catalysts are used only one of them is obtained. The catalysts are metal-organic complexes. Their core consists of a small diameter, positively charged metal, surrounded by large, complex forming organic molecules containing a negatively charged carbon ion. To explain their method of action, it has been currently suggested that the complexes have active areas along their surfaces. The monomer molecules would then react in confined spaces defined by these active surface areas. It is possible to visualize this by thinking of two monomer units able to enter, react in and leave a given space only by orienting in a certain way; thus in the final polymer chain all the units will be arranged in this way and it will be stereospecific.

Air Suspension for Route-Masters

DUNLOP AND FIRESTONE

LONDON TRANSPORT has been making operational trials with rear-axle air-suspension on 50 of its Routemaster buses. The specially-fitted buses will be based on Poplar Garage where some 30 of them have recently entered service and the remainder will be brought into use as they become available. Air suspension has the incidental advantage of maintaining the rear platform at a constant height above the road surface, irrespective of the loading of the bus. The air suspension is confined to the rear wheels, independent coil spring suspension being retained for the front.

The Routemaster is a chassisless vehicle with its mechanical units mounted in front and rear sub-frames which are easily detachable for maintenance purposes and are interchangeable between buses. Four different types of air suspension equipment are being given trials, the units being in each case mounted on the rear sub-frames. The locating holes and fixtures on the sub-frames and bus bodies are identical both for coil springs and for each type of air suspension so that any rear sub-frame can be fitted with any of the coil spring or air suspension systems. The coil spring equipment is fitted with internal telescopic shock absorbers. In the case of air suspension equipment separate arm-type shock absorbers are used, the settings being varied according to the make of the equipment.

Twenty-five Routemasters are being fitted with Firestone 'Airide' rolling diaphragm equipment and 25 with Dunlop equipment. Of the 25 fitted with Firestone suspension, 20 have equipment of Firestone Type 1 and five of Type 2. This equipment, which is the maker's standard (with slight modification), has two surge tanks, each of approximately 600 cu. in. capacity, fixed to the underside of the bus body, and a 'pedestal' base fitted to the rear sub-frame on each side. Each cylindrical surge tank is connected by a rubber diaphragm to the corresponding pedestal. The unit is filled with air under pressure, holding the tank portion away from the pedestal, the gap being filled by the flexible rubber diaphragm which accommodates the relative vertical movement between the body and the frame. The total 'play' allowed is 7in. (3½in. up and 3½in. down) from the normal position of equilibrium. The two types of Firestone equipment differ only in the shape of the 'pedestal,' the first having a natural frequency of 80 cycles per second and the second type a frequency of 70 cycles per second.

The Dunlop equipment, also practically the maker's standard, is of two distinct types, 'Pneuride' triple-convolution, fitted to 20 buses, and 'Dillow' combined convolution and rolling diaphragm, fitted to five buses.

The Dunlop triple-convolution type has a large-capacity surge tank (approximately 1,200 cu. in.) and the rubber diaphragm is constrained by two parallel rings to form a triple bellows or 'concertina' shape. The vertical movement allowed is again 7in., but in this case it is divided into 4½in. above and 2½in. below the equilibrium position. The natural frequency of this equipment is approximately 80 cycles per second. The 'Dillow' type of Dunlop equipment has a smaller surge tank and the rubber diaphragm is constrained into a double convolution. There is also a specially-shaped metal ring on which the lower convolution rolls. The natural frequency of the 'Dillow' equipment also is approximately 80 cycles per second.

The ancillary equipment, comprising an air storage reservoir, a charge valve, and two levelling control valves —one each for nearside and offside air springs—is common to all the air suspension units.

The air supply is taken from the existing compressor via an existing reservoir (for the air-operated gear box) to the charge valve and to the storage reservoir for the air suspension. Air in the storage reservoir is at 60lb. per sq. in. The charge valve acts as a non-return valve to prevent air escaping from the gearbox system in the event of a leak in the air suspension system. Air then passes via the levelling control valves to the surge tanks.

Experiments with air suspension have previously been carried out with one of the prototype Routemaster buses, RM.2, and with the prototype Routemaster Green Line coach, CRL.4. (Details of these preliminary experiments appeared in *RJIP*, August 16 1958.)

Rubbermaid Expansion

Rubbermaid (Canada) Ltd., whose parent company is Rubbermaid Inc., of Wooster, Ind., announced that it is expanding its Cooksville, Ontario, plant by nearly 100%. The 32,000 sq. ft. addition of the company's original plant will bring investment in the factory to $1,300,000.

The extension is expected to be in full operation by January 1. Officials of the company, which makes a long line of moulded rubber and plastic and vinyl plated coated wire household products, predict sales volume will top $1,500,000 in 1960. The company has had a 500% increase in sales in three years of Canadian operations.

'Zodiac' inflatable rubber liferafts manufactured by RFD Ltd., Godalming, Surrey, were used by the French authorities in the rescue work in the South of France during the recent floods.

The Routemaster bus

The Analysis of Plastics

5—APPLICATION OF MODERN METHODS

IN the series of evening lectures on 'Analysis of Plastics' at the National College of Rubber Technology, Dr J. Haslam began the fifth lecture by drawing attention to the use of gas liquid chromatography. After dealing with basic principles of the method, he indicated that for volatile organic substances it provided a better method of separation than most methods previously available.

Examples were described of the application of gas liquid chromatography to the detection and determination of methyl formate, methanol, acetone, methyl acetate, ethyl methacrylate and methyl alpha hydroxy isobutyrate in methyl methacrylate; of vinylidene chloride, trans 1, 2 dichloroethylene, 1, 1 dichloroethane and cis 1, 2 dichloroethylene in vinyl chloride; of vinyl chloride, trans 1, 2 dichloroethylene, 1, 1 dichloro ethane, cis 1, 2 dichloroethylene and trichloroethylene in vinylidene chloride. The use of gas liquid chromatography in the examination of the depolymerization products obtained from polymers and copolymers was discussed, with particular reference to copolymers of methyl methacrylate and ethyl methacrylate; methyl methacrylate and methyl acrylate; methyl methacrylate and styrene. Further, the determination of the proportion of ethoxy compounds in copolymers of methyl methacrylate and ethyl acrylate was described. The material is heated with hydriodic acid in the presence of phenol. The products are purified and collected in normal heptane and to the mixture is added a solution of known amounts of methylene dichloride and ethylidene dichloride in normal heptane. The methylene dichloride and ethylidene dichloride serve as markers. The products are now subjected to gas liquid chromatographic test, when the individual constituents are eluted from the chromatographic column in the following order: methyl iodide, methylene dichloride, ethlidene dichloride, ethyl iodide and heptane.

Proportions

Using this procedure it has been possible to determine whether a given polymer contains ethoxy as well as methoxy groups. Moreover in the chromatogram, from the peak heights due to ethyl and methyl iodides, and the corresponding peak heights of the markers, it has been possible to deduce the relative proportions of the polymerized ethoxy and methoxy esters in the original copolymers. Attention was paid to the use of the method in the examination of solvents which might be present in plastic adhesives.

The isolation of the solvent mixture was described as well as its preliminary examination on a dinonyl phthalate column. This preliminary test provided useful evidence of the presence or otherwise of various fractions of petroleum spirit, *i.e.* which boil at different temperatures, and moreover, it gave evidence of such substances as white spirit, naphtha etc. This test was usually followed by gas liquid chromatographic test of the mixed solvent on columns of quite different character, *e.g.* on a polar, tri-tolyl phosphate column and on a non-polar, paraffin wax column. Organic solvents according to their character behaved quite differently on the two columns. By finding out how the different constituents of a solvent mixture behaved relative to an added marker such as benzene, the analyst could often size up solvent mixtures very quickly indeed.

Anderson's Procedure

It was pointed out that in some cases it was necessary to proceed even further and to freeze out constituents after separation by gas liquid chromatographic test, so that the separated substances were finally available for unequivocal infra-red identification. The application of the procedure devised by Anderson for this purpose was described in connexion with the detection of isopropyl acrylate in a commercial sample of ethyl acrylate. The gas liquid chromatographic examination of alcohols derived from phthalate plasticizers was dealt with, and the mixed alcohols derived from di alphanol phthalate were shown in detail. Finally it was indicated how the method could be applied to the solution of *ad hoc* problems such as the determination of methyl cyclohexane in petroleum ether, and of propane in propylene.

Dr Haslam then went on to indicate how he became interested in Automatic Titrimetry as a result of a visit to the Physical Society's Exhibition some years ago and how in his laboratory automatic titrimeters has ultimately come into daily use. With these titrimeters the bulk of the titrant is introduced from the burette at full bore to within a pre-determined distance from the end point, after which the titrant is delivered drop wise to the required end point. He pointed out the usefulness of such titration methods in the determination of nitrogen in polymers and copolymers. The products of the Kjeldahl digestion were distilled with alkali into standard acid, and the excess acid back titrated with standard alkali to pH 4.5.

Nylon Salt

Chlorine in polymeric materials was determined by fusion of the polymer with sodium peroxide, followed by automatic titration of the chloride in fusion products. The use of the titrimeter was also described in connexion with the determination of metals by EDTA titration. The method for the determination of Nylon 610 salt in the moist material was discussed as well as the titrimetric determination of formaldehyde and acetone. The use of a divided Fischer reagent in the titrimetric determination of water in plasticizers was also dealt with. Apparatus for full scale automatic titimetry was described. This apparatus incorporates an injection motor, a pH meter and a Honeywell-Brown recorder, and enables full scale titrations to be performed with ease. Such operations as the determination of bromides in the presence of chloride and the titration of phosphoric acid were dealt with.

In the field of nonaqueous titrimetry, details were given of a method of determination of the strength of acetic anhydride, of the titration of phenols in pyridine media with sodium methylate, and of the titration of salicylic acid in phenyl salicylate by titrations with tetra butyl ammonium hydroxide in acetone media. The differing behaviour of benzoic acid, salicylic acid and methyl salicylate when titrated with sodium methylate in pyridine media were discussed, and a method for the titration of methacrylic acid groups in a copolymer of methyl methacrylate and methacrylic acid was presented.

Calorimetric Tests

Finally some new colorimetric tests were demonstrated. These included the nitroso resorcinol test for nitrites, the ascorbic acid reduction of phospho molybdates, the Alizarin complexone test for fluorides, the mercury thiocyanate test for chloride, Saville's acid test for thiols, the phenol hydrochloride test for ammonia, the glucose test for epoxy resins and a rather complicated series of colorimetric tests for the same type of resin. Finally a practical demonstration of the automatic titrimeter was made in which phosphoric acid was titration with alkali to give evidence of the end points corresponding with NaH_2PH_4 and Na_2HPO_4.

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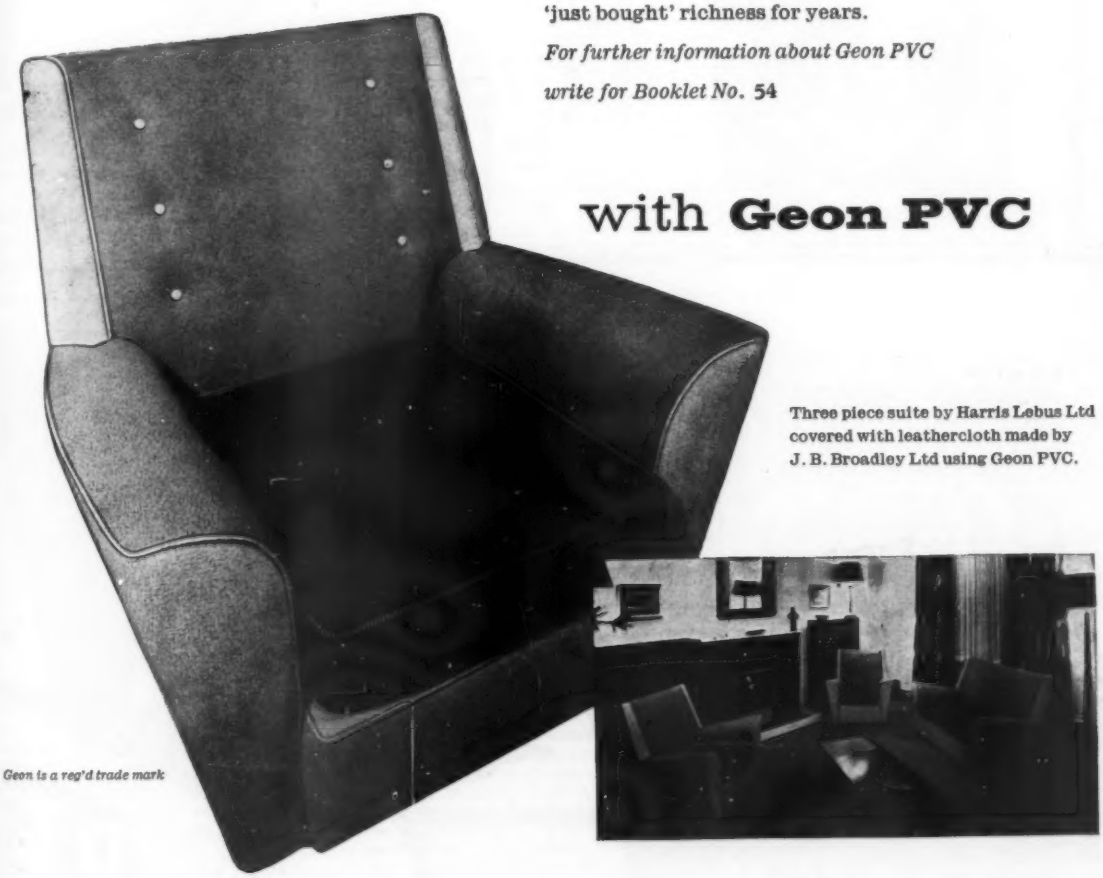

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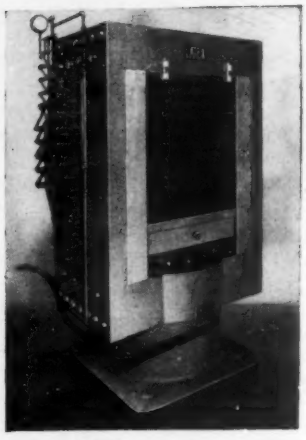

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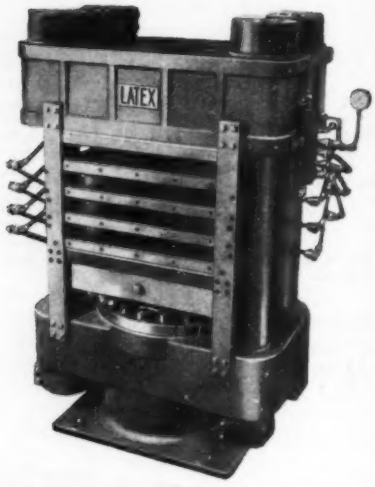

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Book Reviews

RUBBER HANDBOOK (Kautschuk-Handbuch) Vol. 1. (Published in four volumes by Berliner Union, Stuttgart, Germany. Price for the series DM300, 340 or 380 according to conditions of payment.)

Volume 3 of this handbook was the first to appear and was reviewed in this journal on February 21 1959. Volume 1 which was due to appear in July 1959, has now been published. A short introduction leads to Chapter 1 on Natural Rubber by Dr Siegfried Boström who also contributes the following chapter on the Physics of Rubber and is joint author with Dr-Ing Martin Cherubim of Chapter 5—Vulcanization. Electrical Properties of Rubber form the subject of Chapter 3, by Dr Jacob Uelpenich, and the Chemistry of Rubber is dealt with in Chapter 4 by Dr-Ing Ferdinand Kirchhof, who has also written about neoprene type polymers in Chapter 9.

Synthetic rubber is covered in a systematic fashion. The subject is introduced in Chapter 6 by Dr Werner Hofman, who is also responsible for Chapter 8 on Diene Polymers from Individual Monomers, Chapter 11 on Co-polymers and Chapter 12, Butyl Rubber and Other Elastic Vinyl Polymers. Chapter 7 deals with the Preparation of Monomers (Dr rer. nat. Paul Schneider). Polyisobutylene is dealt with in 4 pages in Chapter 10 by Dr-Ing Adolf Schwartz.

The final chapter in the book is on Chlorosulphonated Polythene and has been contributed by Dipl.-Chem. Rolf Schlicht.

As with the previous volume, the printing, production, and binding are excellent. The work suffers from the usual disadvantages associated with different authorship of different sections, namely overlapping and uneven treatment, although the defects are here less than usual because, as will be seen from the above, one author has in some cases dealt with several sections.

A general defect of the book is that the authors have failed to make clear to the reader which of the methods and processes they describe are established and current commercial practice, and which are the subject of patents or processes which have yet to see large-scale application. More guidance to the reader in this respect would have enhanced the value of the work under review.

As would be expected of a book published in Germany, the historical development of synthetic rubber is one of the best sections, and in fact the chapters dealing with synthetic rubber are in general the most satisfactory. Chapter 4 (Chemistry of Rubber) proceeds at once to a consideration of the various reactions which rubber can undergo, but without explaining clearly to the reader what is the original structure which may be modified in the ways described.

The book gives a clear and accurate picture of the state of knowledge at the present time, being up-to-date and comprehensive.

PHENOLIC RESINS.—David F. Gould. (Reinhold Publishing Corporation, USA. Chapman and Hall, London. 46s.)

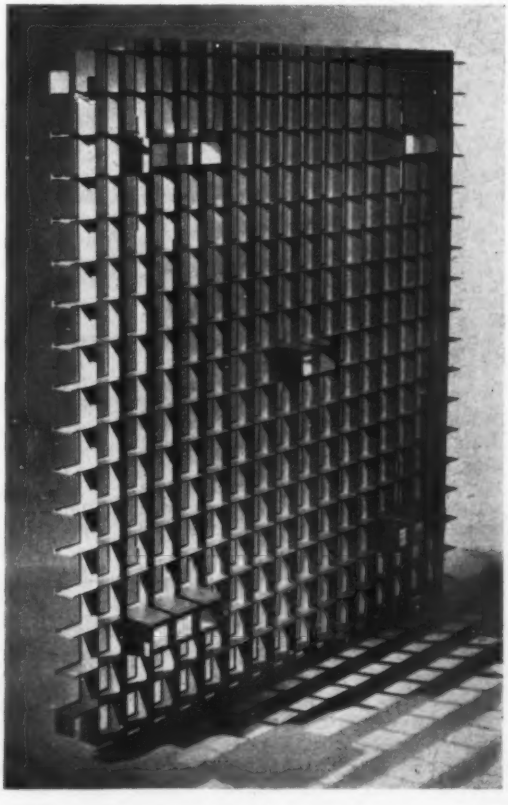
This is the eleventh volume to be issued in the Reinhold Plastics Application Series and covers one of the oldest fields in the plastics industry. A preliminary chapter deals with the present status of phenolics, mainly in statistical terms which, although the book is dated 1959, extend in most cases no later than 1956. Raw materials and their production methods are considered in the second chapter. Two following chapters cover resin production and moulding compounds. The remainder of the book deals with various applications, such as adhesives, laminates, and protective coatings.

In a book such as this one ought to be able to look for clear-cut information presented in a form which is readily understood, but here these features are lacking. Much of the information is vague, platitudinous, and wordy. For example, to devote half a page to explaining why phenolics are useless in gramophone records seems, in a book of this size, to be mere padding. The author's meaning is sometimes hard to comprehend, as for example in the table on condensation catalysts on page 28. Considerable reference is made to the patent literature, but many of the patents cited represent pious hopes rather than practical applications. A minor irritation is the use of the word 'alloy' to mean mixture or blend of a phenolic with other materials.

Phenolic resins have played a very important role in the history and growth of the plastics industry. Today, they are not as much in the limelight as some of the modern thermoplastics, but production figures show that they still form a not inconsiderable portion of the total plastics production—and for many applications they are still without rival. They deserve better treatment than is given by this book.

∴ Copies may be ordered through the Books Department, RUBBER JOURNAL AND INTERNATIONAL PLASTICS, Maclaren House, 131 Great Suffolk Street, London, S.E.1.

Kingsley and Keith Ltd. have been appointed exclusive distributors for the UK, Northern Ireland and Eire for Amoco Indopol polybutenes. Kingsley and Keith Ltd. are to handle all ten grades of Indopol polybutenes, which are light coloured, viscous, aliphatic hydrocarbon resins having molecular weights from 300 to 1,900 and viscosities at 210°F. of 40.6 to 20,500 SSU.



After considerable research and development Fluor Products Co. in the US and Head Wrightson Processes in the UK have introduced Polygrid plastic packing for power station and industrial cooling towers. Ekco Plastics Ltd., Southend, are carrying out the moulding in Britain of these grids. Moulded in high-density polythene, they are expected to have a considerably longer life than conventional wooden slats and they cut the assembly time of the cooling tower while packing a greater cooling capacity into a given space. They can be interlocked when assembled one above the other or spaced at intervals in the tower depending on the duty required; they measure approximately 3 ft. square. For applications in which the water contains no hydro carbons, high-impact polystyrene may be used in place of polythene and the mould has therefore been designed to cater for either material

Rubber Statistics

WORLD POSITION AT THE END OF SEPTEMBER

THE Secretariat of the International Rubber Study Group has now issued preliminary details of the world rubber position up to the end of September. The table which follows shows the natural rubber production and consumption totals for the first three quarters of the year (in 1,000 long tons):

NATURAL RUBBER

	Sept. 1959	Jan.-Sept. 1959	Jan.-Sept. 1958
Production ..	170.0	1,482.5	1,415.0
Consumption..	187.5	1,547.5	1,442.5
		Change since Jan. 1, 1959	
Stocks at September 30:			
In producing areas		255.0 –	37.5
In consuming areas		205.0 –	12.5
Afloat		225.0	—
		685.0 –	50.0

Synthetic Rubber

The synthetic rubber production and consumption position is set out in the following table:

SYNTHETIC RUBBER

	Sept. 1959	Jan.-Sept. 1959	Jan.-Sept. 1958
Production ..	145.0	1,162.5	860.0
Consumption..	140.0	1,140.0	897.5
		Change since Jan. 1, 1959	
Stocks at September 30..		267.5 +	10.0

US General Position

The United States Department of Commerce has issued the following preliminary statistics for the month of September (in long tons):

NATURAL RUBBER

Consumption:
49,252 tons, of which latex 6,342 tons
Stocks:
78,208 tons, of which latex 11,742 tons

SYNTHETIC RUBBER

	Production	Consumption	Stocks
S-type ..	97,677	79,835	147,400
Butyl ..	7,399	6,579	9,535
Neoprene	10,888	7,326	12,845
N-type ..	3,883	3,119	8,526
	119,847	96,859	178,306

Total new rubber consumption during September amounted to 146,111 tons, compared with a total of 137,951 tons in August, with natural rubber accounting for 33.71%, as compared with 34.01%. Total consumption to the end of September amounted to 1,220,803 tons, an increase of some 25% over the comparable 1958 total of 970,877 tons.

Indonesia

The Study Group states that reported exports from the Republic of Indonesia during September amounted to 52,340 tons, 12,393 tons being of estate origin and the remaining 39,947 tons coming from smallholdings. Total reported exports of rubber from Indonesia during the first nine months of the year were 481,143 tons, compared with the 1958 figure of 406,949 tons.

Western Germany

The West German Federal Bureau of Statistics has recently released details of tyre production for the month of September, which showed an increase both over the previous month and over the corresponding month of last year, amounting to a provisionally estimated figure of 19,173 tons; the August production had only reached 16,883 tons, while in September last year, production had been still lower at 16,301 tons. To the end of September production of tyres had amounted to 147,321 tons, or some 29,000 tons or about 24% more than the comparable figure for 1958. This total included some 10¼ million bicycle tyres and 8¾ million car tyres, showing increases respectively of about 1 million and 2¼ million units over the previous year.

Output of other hard and soft rubber goods during September amounted to a provisional total of 22,224 tons, an increase of some 2,000 tons over the previous month and some 3,000 tons over the comparable month of 1958, though the latter total did not then include the Saar area. For the three quarters of the year, output has reached the figure of 172,304 tons, as against 161,662 tons, though once again the proviso regarding the Saar area applies.

Details of imports up to the end of August are also given. These totalled 86,245 tons of natural, including sole crepe, and included 40,244 tons from Malaya, 11,988 tons from Indonesia, 8,600 tons from Nigeria and 8,382 tons from Ceylon. Imports of synthetic amounted to 22,069 tons during the same period, and included 16,562 tons from the USA, 2,835 tons from Canada and 2,168 tons from Italy.

France

The French Ministry for Industry and Commerce has now released details of the rubber position at the end of August. According to the announcement, the August consumption total was down to 6,094 tons, doubtless due to annual holidays, compared with the July figure of 16,533 tons. This consumption total is further sub-divided into natural rubber: 3,357 tons, latex: 410 tons, and synthetic: 2,327 tons, of which GR-S, Buna and Polysar accounted for 1,798 tons. As against this total for consumption, a figure of 11,937 tons is quoted for rubber entering into plants. Rubber stocks at the end of August stood at 29,090 tons, an increase of nearly 6,000 tons during the month. This total included 18,575 tons of natural, 1,830 tons of latex, and 8,685 tons of synthetic, of which 6,268 tons consisted of GR-S, Buna and Polysar.

Tyre production totalled 22,450 tons in September (in August production had been down to 5,470 tons). Imports of tyres in September amounted to 518 tons, while exports totalled 3,503 tons. Industrial rubber production in September amounted to 18,460 tons.

Patent Specification

The following information is prepared from published Patent Specifications by permission of the Controller of H.M. Stationery Office. The full Specifications can be obtained from the Patent Office, 25 Southampton Buildings, W.C.2, at 3s. 6d. per copy (including postage).

Polymerization of Ethylene

No. 816,586. Ethyl Corporation. Application and Filed, January 3 1957. Application in USA, January 4 1956. Published, July 15 1959.

Ethylene is polymerized by means of a catalyst consisting of a subhalide of titanium admixed with a catalyst of the Friedel Crafts type, such as aluminium chloride. The polythene formed has a relatively high and uniform melting point and improved tensile strength and other physical properties. The polymerization process may be applied to other olefins, such as propylene, butadiene, isoprene, isobutylene, styrene, etc. The polymerization temperature ranges from 0° to 250°C., preferably 50° to 150°C., and the pressure from sub-atmospheric to 3,000 atmospheres or more, but generally above 1 and up to 100 atmospheres. The greater crystallinity of the polythene produced by this method of polymerization makes it particularly suitable for fibres and for products where (a) it is subjected to relatively high temperatures and/or (b) it requires high rigidity and strength.

Shorter Abstract

Moulded Mats. 815,083. Dunlop Rubber Co. Ltd. Filed, September 20 1955. — A moulded mat has a base layer of vulcanized natural or synthetic rubber composition and a coloured surface layer of a thermoplastic composition based on a polymer derived from vinyl or vinylidene chloride. The invention applies particularly to car mats made by the vacuum moulding process.

COMPANIES in the NEWS

The management of N.V. Rubber Cultuur Mij. 'Amsterdam' (RCMA), Amsterdam, informed shareholders that business in the current year has hitherto been favourable. An interest was acquired in N.V. Verenigde Nederlandse Rubberfabrieken Hevea, Oosterbeek.

The Salala Rubber Corporation, in which the RCMA has a 75% interest, has been founded at Monrovia, Liberia. This company is managed by the RCMA. It is the intention to start a 6,250-acre rubber plantation with expansion potentialities to 12,500 acres. Work has already begun.

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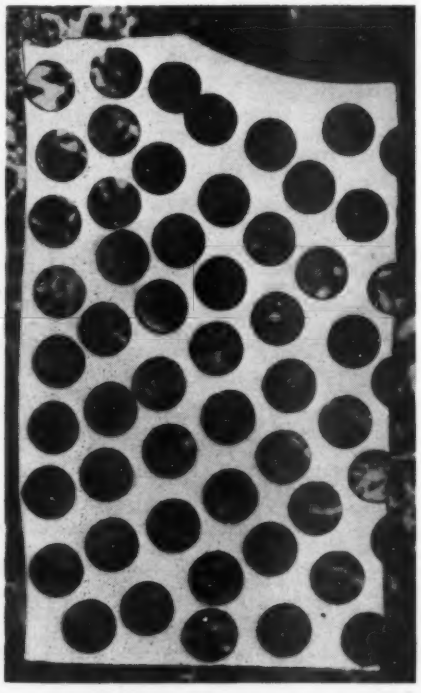

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Rubber Markets

LONDON

Price movements have continued to be dominated by advices from the East which have fluctuated somewhat and on balance the spot quotation is a little easier. In the case of the forward positions, however, there has been some improvement in the nearer dates but actual trading has been small on most days. The statistical position remains satisfactory.

Latest prices are as follows:

No. 1 RSS Spot: 34⅜d.-35⅛d.

Settlement House:

January 34⅛d.-34⅜d.

February 33⅝d.-33⅞d.

March 32⅜d.-33d.

January/March 33⅝d.-33⅞d.

April/June 31⅝d.-31⅞d.

July/September 31d.-31⅛d.

October/December 30d.-30⅛d.

No. 1 RSS cif basis ports:

December 34⅛d.-34⅜d.

January 34⅛d.-34⅜d.

Godown:

December 117¾ (Straits cents).

Latex

Centrifuged latex per gallon in drums, December shipment 21s., January 20s. 9d., February 20s. 9d., cif European ports. Spot, 21s. 6d., January 22s. Bulk, nominal 20s. 3d. Creamed, seller, December, 20s. 6d. Normal, seller, 15s. 9d.—January/February.

AMSTERDAM

The Amsterdam rubber market ruled as under on December 7:

	Guilders per kilo	
No. 1 RMA	Dec. 7	Previous
December	3.40	3.40
January	3.29	3.25
February	3.28	3.25
March	3.25	3.25
January/March ..	3.28½	3.25
April	3.14	3.09

Sales: 120 Tendency: Quiet

BANGKOK

No. 1 RSS

The price for No. 1 RSS, at Bangkok on December 8 was 38 (38) US cents per lb.

SINGAPORE

Better overseas advices and some covering in December No. 1 RSS caused prices to advance early in the morning. Profit-taking at the higher levels and upcountry selling reversed the trend and buyers became hesitant. Lower sheet interest was selective and little business was done. Factories were quiet. The market was quiet in the afternoon and an easy tendency developed towards the close. Buyers withdrew, and the official close was at the lowest levels of the day. The market finished on an uncertain note.

	Straits cents per lb., fob Malayan ports to open ports	
	Dec. 7	Prev. Close
No. 1 RSS, Dec.	122½–122¾	121 –121½
Jan.	118½–118¾	118½–118¾
No. 2 RSS, Dec.	121¾–122¼	120½–121¼
No. 3 RSS, Dec.	120½–121½	119½–120
No. 4 RSS, Dec.	118½–120½	117½–119
No. 5 RSS, Dec.	115 –117	113½–115
No. 1 Spot ..	124 –126	125½–126½
No. 3 blanket, thick remilled, Dec.	117 –119	115½–117½
No. 1 fine pale crepe, Dec. ..	136 –138	136 –138
2x thin brown crepe, Dec. ¼	116 –117	114 –115

Tendency: Uncertain

The Industries Syndicate quote latex, native produce, 60% centrifugal, packed in rectangular drums fob at 212.80d. per gallon.

CEYLON

No. 1 RSS

The price for No. 1 RSS, spot, at Colombo on December 7 was 143½ Ceylon cents per lb.

NEW YORK

The following landed prices ruled in New York on December 7.

Dealers' Prices

	Ex-dock, Cents per lb.	
	Dec. 7	Previous
No. 1 RSS, Dec...	41⅜n	41b –41⅛a
Jan. ..	41½n	41b –41⅛a
No. 2 RSS, Dec...	41⅛n	40⅞b–41⅛a
Jan. ..	41⅜n	40⅞b–41⅛a
No. 3 RSS, Dec...	41⅜n	40⅞b–41¼a
Jan. ..	41½n	40⅞b–41¼a
No. 1 RSS, Spot..	41⅜n	41b –41⅛a
No. 3 amber blanket crepe, Feb...	39½–39⅝	39½n
No. 1 latex, thin crepe, Dec. ..	44¼n	43½n
No. 1 latex, thick crepe, Dec. ..	45n	44½n

Futures—Rex Contract

	US cents per lb.	
	Close	Prev. Close
Jan. ..	41.80–41.85t	41.30t
March ..	39.85–39.95t	39.50t
May ..	38.85–38.75t	38.50t
July ..	37.85b–38.05a	37.50b–37.90a
Sept. ..	37.35b–37.60a	37.00b–37.25a
Nov. ..	36.85b–37.10a	36.50b–36.75a
Jan. ..	36.35b–36.60a	36.00b–36.25a

Tendency: Firm Sales: 39

Rubber futures were moderately higher on light covering following the advances abroad. Traders said physicals were quiet and factories were buying little. Shipment offerings were small.

DJAKARTA

Offerings were scarce on December 7 and buyers' interest was limited to ready shipments. About ten tons of No. 1 sheet for ready delivery were sold at 57 rupiahs per kilo. The market closed steady. Sheet No. 1 for ready delivery was quoted at 52 cents above last Saturday's level.

	Rupiahs per kilo	
	Dec. 7	Previous
Spot No. 1 Priok ..	56.25b	56.00b
Spot No. 2 Priok ..	55.25b	55.00b
Spot No. 3 Priok ..	54.25b	54.00b
No. 1 fine pale crepe, spot	49.50b	47.50b

Tendency: Steady

Rubber Crop Returns

Unless otherwise indicated the figures quoted, to the nearest thousand lb., represent crop returns for the month stated and for the number of months of the planting company's financial year to date. Corresponding figures are given in parentheses.

RUBBER ESTATE AGENCY

October

Bandar Sumatra.—100 (114). 3 mths—291 (282).
Batu Kawan.—69 (67). 2 mths—133 (127).
Buntar.—123 (103). 16 mths—1,682 (1,439).
Eastern Sumatra.—399 (431). 8 mths—2,586 (2,585).
Amalgamated Rubber.—27 (31). 10 mths 307 (318).
Java Rubber Plantations.—44 (60). 10 mths—735 (778).
Jeram.—319 (222). 1 mth—319 (222).
Kepitigalla.—58 (49). 7 mths—377 (396).
Kuala Lumpur.—561 (639). 1 mth—561 (639).
Langkat Sumatra.—80 (79). 10 mths—739 (731).
Soember Ajoe.—11 (25). 1 mth—11 (25).
Sungei Bahru.—127 (112). 4 mths—520 (419).
Sungei Kahang.—179 (155). 8 mths—1,263 (1,152).
Tambira.—126 (125). 4 mths—458 (482).
Tamiang (Malaya).—72 (72). 1 mth—72 (72).
Tanjong Malim.—409 (390). 4 mths—1,561 (1,369).
Sennah.—158 (130). 10 mths—1,450 (1,346).

SHARPE, ESTALL & CO. LTD.

Anglo-Johore Rubber Plantations Ltd.—36 (34). 3 mths—113 (102).
Bekoh CRE Ltd.—214 (221). 6 mths—1,404 (1,395).
KPRP Ltd.—67 (56). 6 mths—441 (356).
Rim (Malacca) RE Ltd.—223 (226). 4 mths—904 (882).
Sittang Valley RE Ltd.—173 (180). 4 mths—226 (305).
Kurunegala Rubber Co. (1929) Ltd.—27 (23). 10 mths—249 (281).

October

Kuala Reman.—149.
Beau Sejour.—68 (32). 4 mths—224 (231).
Batu Tiga (Selangor).—190 (245).
Sungei-Timah (Perak).—55 (55). 7 mths—306 (337).

Industry INTELLIGENCE

Technical Data

ASRC SB Rubbers

Data sheets on ASRC-1712, ASRC 1713 and ASRC-3106 have recently been issued by the American Synthetic Rubber Corporation, represented in the UK by the Anchor Chemical Co. Ltd., Manchester 11. ASRC-1712 and ASRC-1713 are oil-extended SB rubbers, 1712 containing 37.5 phr of a highly aromatic processing oil and 1713 containing 50 phr of a naphthenic processing oil. Both copolymers are manufactured by emulsion polymerization at 43°F. using a 50:50 mixture of rosin acid and fatty acid soaps and a free radical type activation system. Both contain a stabilizer; in 1712 it is staining and in 1713, non-staining. ASRC-3106 is an SB rubber manufactured by emulsion polymerization at 50°F. using a fatty acid soap, a free radical type activation system and a non-staining type of shortstop. It has been coagulated by a method designed to leave a relatively low ash residue (about 0.25%) in the finished rubber. It is an improved non-discolouring and non-staining rubber with excellent processing characteristics and in baled form it is practically 'water-white.'

Data are given for the chemical specification limits for ASRC-1712 and 1713 and for typical chemical properties of ASRC-3106. Mooney viscosity, raw and compound, and vulcanizate properties of the rubbers are also given. ASRC-1712 is an excellent general-purpose polymer for use in applications where discolouration and staining are not important considerations. It is particularly recommended for tyres, camelback and mechanical goods. ASRC-1713 is very similar to ASRC-1703 except that it is extended with an additional 25 parts of a non-staining oil. It provides a more economical base polymer for a range of mechanical goods where some sacrifice of physical requirements can be tolerated.

Vulcaprene

Vulcaprene is a synthetic, rubber-like material made by the reaction of a diisocyanate with the condensation product of a dibasic acid, a diglycol and a diamine. Particulars of the chemical structure of Vulcaprene and its vulcanization, and of the uses of the various grades are given in Technical Information—Rubber PC/R.65, issued by the Polymer and Chemicals Service Department, Dyestuffs Division, Imperial Chemical Industries Ltd.

Vulcanization of Vulcaprene with sulphur is not possible but special vulcanizing agents for hot vulcanization and for room-temperature vulcanization are available. Vulcaprene is marketed in five grades, namely, Vulcaprene A, AC230, AC160, AC90 and AC50. Vulcaprene A may be compounded for spreading, moulding, frictioning or extruding. It is completely resistant to oil and petrol, has a low freezing point and possesses good physical properties. Its permeability to gases is stated to be the lowest of any commercially-available synthetic rubber while the material is extremely resistant to ozone and oxygen. Vulcaprene A appears to be particularly suited to uses where it is in contact with petrol, such as carburettor glands, joints and gaskets, flexible petrol tubing, diaphragms and flexible containers. Coating compositions can be made from mixtures of Culcaprene A and hydrolysed vegetable-tanned leather.

The AC grades of Vulcaprene are suitable for adhesive and varnish formulations, the essential difference between the four grades being the plasticity and solution viscosity. The higher the AC grade number, the higher the Williams plasticity figure and the more viscous the solution. One particularly valuable application of the AC90 and AC50 grades is for the manufacture of varnishes for rubber goods. The varnishes are as elastic as the rubber itself and will therefore withstand flexing without danger of cracking and peeling.

Machines, Materials and Equipment

Scott CRE Tester

The Scott constant-rate-of-extension (CRE) stress-strain tester for rubber and other materials is an instrument of advanced design entirely free from errors of inertia and friction. An electronic weighing system is employed and the stress-strain curve is recorded automatically on a chart from which ultimate tensile strength, yield point, elastic limit and other variables may be ascertained.

The stressing action at constant speed is by upward movement of the crosshead, the lower clamp remaining fixed. All of the many Scott clamps and holding fixtures can be used on the CRE tester and they can be changed very rapidly without the use of special tools. On the chart, the horizontal axis is the stress (load) and the vertical axis is the strain (elongation). Vertical chart travel occurs when the crosshead moves upwards and is in constant relation with it. This relationship can be varied from 0.05 to 400in. of chart travel per inch of specimen extension. Thus, great magnification of the curve is possible. The CRE tester is complete in a single unit which is floor mounted, free standing and requires only one electrical connexion and one ground connexion. It is simple and convenient to operate.

For production testing, the CRE tester is used in its basic form, but there are nine optional features for increasing the versatility of the instrument for laboratory testing. Any of these optional features may be included in the CRE tester at the time of purchase or they may be added at any time on a do-it-yourself basis by following simple instructions for inserting additions in fitments already provided in the basic CRE tester. Detailed information on the Scott CRE tester is given in an illustrated folder issued by Scott Testers Inc., 101 Blackstone Street, Providence 1, R.I., USA.

New Publications

Bakelite Epoxide Resins

A booklet entitled 'Bakelite Epoxide Resins and their Applications' gives concise information on the main uses of epoxide resins, as follows: (1) Tool manufacture. (2) Laminating. (3) Surface coatings. (4) Adhesives and cements. (5) Electrical engineering and electronics applications. Brief particulars are included of several hardeners and a flexibilizer for epoxide resins as well as a new type of epoxide resin, each of these materials representing new developments in epoxide resin technology. A chart forming a guide to publications on Bakelite epoxide resins is enclosed with the booklet, copies of the chart and booklet being obtainable from Bakelite Ltd., 12-18 Grosvenor Gardens, London, S.W.1.

European Technical Digests

The European Productivity Agency, an inter-government body which exists within the Organization for European Economic Co-operation, has launched a series of publications called European Technical Digests. These are compiled by the agency from some 1,000 technical journals in eleven different languages. The aim of the digests is to present to businessmen new techniques developed in many fields; the best ideas seen in the journals received by the agency are re-written in language which can be understood by everybody and suitable illustrations are included with every item, the source of which is given so that enquiries can be pursued by subscribers to the series. The digests themselves are published in a handy pocket size and each page is perforated at the binding so that it can be torn out. These publications, which should be very useful to concerns wishing to keep up to date on technical developments, and are unable to read the necessary journals thoroughly, are available in the UK from HM Stationery Office, P.O. Box 569, London, S.E.1. The annual subscription (12 issues) is £3 10s.

PLASTICS STATISTICS

ALTHOUGH UK sales of plastics materials during the third quarter of this year were somewhat lower than in the second quarter, stocks of materials increased in the quarter, indicating that the record level of production reached in the second quarter was being maintained. Total net sales in the third quarter at 122,000 tons were more than 24,000 tons (or 25%) higher than in the corresponding quarter in 1958. Stocks of materials increased by 4,700 tons in the third quarter whereas there has been a run-down of 2,100 tons in stocks during the second quarter of the year.

Expansion continued to be most marked in the thermoplastic field, with large increases (as compared with the previous year) in sales of polythene and polyvinyl chloride. However, sales of thermosetting materials were also well above the level of the previous year.

Exports in the third quarter were not quite as high as in the record second quarter of the year, but at over 35,000 tons were almost 8,000 tons (or 28%) higher than in the corresponding period last year. Imports were again high at 14,000 tons, the same level as in the previous quarter and about 3,000 tons more than in the third quarter of 1958.

UK NET SALES OF PLASTICS MATERIALS, THOUSAND TONS

	1959 April-June	1959 July-Sept.
Thermosetting materials:		
Alkyds	13.0	12.4
Aminoplastics	13.2	13.2
Phenolics and cresylics	18.3	16.8
Polyesters	1.7	1.7
Other	2.1	2.0
Total thermosetting	48.3	46.1
Thermoplastic materials:		
Cellulose plastics	3.0	2.9
Polyvinyl chloride	24.3	21.4
Polystyrene	10.2	9.8
Polyvinyl acetate	3.8	3.0
Other	38.1	38.6
Total thermoplastic	79.3	75.7
Total, all plastics materials	127.6	121.8
Stocks at end of period:		
Thermosetting materials	16.1	17.1
Thermoplastic materials	39.2	43.0

Forth Chemicals Extension

Forth Chemicals Ltd., manufacturers of monomeric styrene at Grangemouth, Stirlingshire, have approved an expansion of their plant which will increase capacity to about 50,000 tons per annum in twelve months' time.

Forth Chemicals Ltd. is owned two-thirds by British Hydrocarbon Chemicals Ltd. and one-third by Monsanto Chemicals Ltd. British Hydrocarbon Chemicals is itself jointly owned by the British Petroleum Co. Ltd. and the Distillers Co. Ltd.

Future Events

INSTITUTION OF THE RUBBER INDUSTRY

Manchester Section.—Monday December 14 at the Engineers' Club, Manchester, at 6.45 p.m. 'Stress-Relation Measurements in the Investigation of Ageing of Vulcanizates,' by Dr J. Scanlan (RABRM).

Midland Section.—Monday December 14 at the James Watt Institute, Birmingham, at 6.45 p.m. 'The Ageing and Weathering of Rubber and Some Plastics,' by Dr W. McG. Morgan (Monsanto Chemicals Ltd.).

Preston Section.—Monday December 14 at the BTR Industries Social Club, Farington, Preston, at 7.15 p.m. 'Education in Industry,' by Mr R. F. Marshall, B.Sc., A.M.I.Mech.E. (Metropolitan-Vickers Electrical Co. Ltd.).

Scottish Section.—Tuesday December 15 at the Caledonian Hotel, Edinburgh, at 7.30 p.m. Joint meeting with the Plastics Institute. 'Colouring of Rubber,' by Mr C. Musgrave, A.M.C.T. (Geigy Co. Ltd.).

PLASTICS INSTITUTE

North-Eastern Section.—Wednesday December 16 in the Second Dining Room of the Eldon Grill, Grey Street, Newcastle, at 7 p.m. Film evening.

Scottish Section.—Tuesday December 15 at the North British Hotel, Edinburgh, at 7.30 p.m. 'The Colouring of Rubber,' by C. Musgrave (The Geigy Co. Ltd.). Joint meeting with the Scottish Section, IRI.

Yorkshire Section.—Wednesday December 16 at St. Mark's House, 186 Woodside Lane, Leeds 2, at 7.15 p.m. 'Electrical Heating for the Plastics Industry,' by A. Westerman, B.Sc., Ph.D., A.Inst.P., F.I. Ceramics (Geo. Bray and Co. Ltd.).

The Firestone Tire and Rubber Company announce that it is now manufacturing inflatable cushions for the support and protection of freight during shipment. Exhaustive tests of this 'AIR-BLOK' have proved that the cost of preparing a load of freight for shipment with pneumatic dunnage is very much lower than the cost of using conventional material and methods

TRADE MARKS

Objections to the registration of any of the undermentioned applications may be lodged with the Comptroller-General of Patents, Designs and Trade Marks at the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, within one month of the date mentioned. The objections must be stated on Trade Marks Form No. 7, cost £2, obtainable through any money order office. The extracts—from 'The Trade Marks Journal'—given below are reproduced by permission of the Controller of H.M. Stationery Office.

NORTHYLON (789,697) For complete articles of clothing for protection against accidents or injury. By James North and Sons Ltd., Godley Mills, Hyde, Cheshire. To be associated with No. 702,845 (3846, 138) and others. (Class 9; September 23 1959.)

NORTHYLENE (789,696) For complete articles of clothing for protection against accident or injury. By James North and Sons Ltd., Godley Mills, Hyde, Cheshire. To be associated with No. 702,845 (3846, 138) and others.

FABLONITE (785,750) For laminations of synthetic resin plastics in sheet form prepared for use in the construction or decoration of buildings and of the like civil engineering constructions. By Commercial Plastics Ltd., Willington Quay, Wallsend-on-Tyne, Northumberland. To be associated with No. 720,714 (3933, 934) and another.

SAPPHIRE (790,524) For synthetic resin plastics in the form of sheets, rods, tubes, blocks, strips and shaped sections all included in Class 17. By Tufnol Ltd., Wellhead Lane Works, Wellhead Lane, Perry Barr, Birmingham, 22b. (Class 16; September 30 1959.)

FANPAN (B788,614) For wall plaques in the form of face masks, being made of rubber. By Artique Studios Ltd., 33 Great Queen Street, London, W.C.2, manufacturers, 18th March 1959. (Class 17; September 30 1959.)

BRONOIL (775,165) For parts of motor road vehicles included in Class 12. By Metal and Plastic Compacts Ltd., Armoury Road, Small Heath, Birmingham, 11. (Class 12; September 30 1959.)

HONEST JOE (789,140) For games (other than ordinary playing cards). By Saga (Plastics) Ltd., Gay Works, 2b Brownlow Road, London, E.8. (Class 28; September 30 1959.)

NYLINOX (787,904) For parts of machines included in Class 7, being goods made wholly or substantially wholly of nylon. By Faber S.A., 2 Boulevard Faber, Sedan (Ardennes), France. Address for service is c/o A. A. Thornton and Co., Northumberland House, 303-306 High Holborn, London, W.C.1. (Class 7; September 30 1959.)

DISPERCEL (785,227) For cellulose in chip form for industrial use in the manufacture of lacquers. By Runnymede Dispersions Ltd., Windsor Road, Egham, Surrey. (Class 1; September 30 1959.)

DEXEL (785,269) For plastics in the form of powders, granules or the like for moulding purposes; and mouldable materials having a basis of a cellulose derivative or a synthetic resin in the form of sheets, bands, strips, films, plates, slabs, blocks, bars, rods, tubes or cylinders; all being chemical products used in industry. By British Celanese Ltd., Celanese House, 22 and 23 Hanover Square, London, W.1. (Class 1; October 7 1959.)

SOLUFILM (791,050) For plastics in the form of film all for wrapping and packaging purposes, and containers included in Class 16 made therefrom. By Société des Usines Chimiques Rhone-Poulenc 21 Rue Jean-Goujon, Paris 8e, France. Address for service is c/o W. Symmons and Co., 329 High Holborn, London, W.C.1. (Class 16; October 3 1959.)

PATENT LIST

Printed copies of the Specifications in the following list, published by permission of the Controller of H.M. Stationery Office, can be obtained from the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d., including postage, but about six weeks after the date of this publication will usually elapse before they come available. Orders with remittance may be sent in advance to the Patent Office, and will be fulfilled immediately the Specifications are published.

COMPLETE SPECIFICATIONS ACCEPTED

Open to public inspection on September 16 1959

Monsanto Chemical Co. Copolymer compositions. 820,154.

General Electric Co. Graft copolymers of polybutadiene and a vinyl aryl compound. 820,089.

W. S. Hodgkinson and Co. Production of synthetic resin-filled paper. 820,236.

United States Rubber Co. Cure of polyurethanes. 820,004.

United States Rubber Co. Polyurethane elastomers and method of making same. 820,005.

Farbenfabriken Bayer A.G. Apparatus for the manufacture of porous or homogeneous polyurethane plastics. 820,265.

General Electric Co. Polyester coating compositions and electrical conductors coated therewith. 820,343.

Soc. Rhodiaceta. Multi-filament yarns based on substantially linear polythene and their production. 820,191.

Allied Chemical Corporation, formerly Allied Chemical and Dye Corporation. Process of producing pure silicon. 820,192.

Union Carbide Corporation PVC copolymer polyurethane primers for vinyl resin coatings. 820,145.

Farbenfabriken Bayer A.G. Process for the manufacture of porous or homogenous polyurethane plastics. 820,266.

K. Ziegler. Catalysts for the polymerization of ethylene. 820,264.

Open to public inspection on September 23 1959

Dunlop Rubber Co. Ltd., and Glovers (Chemicals) Ltd. Antistatic plastic materials. 820,541.

Imperial Chemical Industries Ltd. Extrusion of organic thermoplastic materials. 820,620.

Standard Oil Co. Polymers from propylene. 820,727.

Goodyear Tire and Rubber Co. Rubbery polymer-antioxidant compositions. 820,486.

Imperial Chemical Industries Ltd. Extrusion of film. 820,624.

Wacker-Chemie G.m.b.H. Apparatus for granulating plastic masses. 820,729.

Petrochemicals Ltd. Low - pressure polymerization of olefins and catalysts suitable therefor. 820,450.

Institut Francais Du Petrole Des Carburants Et Lubrifiants. Polyesters. 820,571.

Phillips Petroleum Co. Vulcanization of hydroxy-containing polymers. 820,451.

Emhart Manufacturing Co. Method and apparatus for shaping articles from thermoplastic sheet material. 820,408.

Distillers Co. Ltd. Olefin polymerization process. 820,411.

National Automatic Tool Co. Inc. Control mechanism for an injection moulding machine. 820,644.

Dow Chemical Co. Adjustable extrusion die. 820,716.

Distillers Co. Ltd. Process of producing epoxides. 820,461.

Rohm and Haas Co. Process for preparing dimethylaminoethyl methacrylate. 820,560.

Rohm and Haas Co. Anion-exchange resins and process for making same. 820,665.

Sun Oil Co. Polymerization of olefins. 820,425.

Hercules Powder Co. Poly (vinyl) ethers and preparation thereof. 820,469.

Manufactures des Glaces et Produits Chimiques de Saint-Gobain, Chauny and Cirey S.A. Manufacture of fibres, in particular glass fibres. 820,526.

Polymer Corporation Ltd. Separation of olefines. 820,527.

Chemische Fabrik Pfersee G.m.b.H. Method for making hardenable, basic silicon-containing condensation products. 820,529.

Farbenfabriken Bayer A.G. Process for the polymerization of vinyl and vinylidene compounds. 820,675.

Montecatini Soc. Generale per L'Industria Mineraria E Chimica. Machine and process for the production of laminates. 820,762.

Firestone Tire and Rubber Co. Stabilized oil-extended synthetic rubber. 820,601.

Badische Anilin and Soda-Fabric A.G. Production of polymerization products from lactams having 5 to 10 ring members. 820,607.

Ruhrchemie A.G. Process for the production of polyolefins. 820,773.

Knapsack-Griesheim A.G. Process for purifying acrylonitrile. 820,692.

NEW COMPANIES

P.H. Thermal Products Ltd. (641,022).—November 2. Capital: £5,000 in £1 shares. To carry on the business of manufacturers of and dealers in insulating materials, etc. The directors are: Peter H. Hill and Judith P. Hill. Regd. office: Westgate, Baildon, Yorks.

Trimwryte (Rubber) Co. Ltd. (641,653).—November 10. Capital: £100 in £1 shares. To carry on the business of manufacturers and repairers of and dealers in rubber, plastic, balata and gutta percha, rubber and plastic tyres, tubes, aprons, boots, shoes, etc. The directors are: Malcolm J. H. Russen, 23 Northcote, Rickmansworth Road, Pinner, Middlesex; Joseph G. Owen-King, 67 Barnhill, Wembley; Peter F. Gladden, Chelsea Town Hall, Chelsea, S.W. Regd. office: 453a High Road, Wembley, Middlesex.

COUNTY COURT JUDGMENTS

NOTE.—*These Judgments which are supplied from the Registry of County Court Judgments, Lord Chancellor's Department, 3 Dean's Yard, London, S.W.1, are not necessarily for debt, and some may have since been satisfied. They may be for damages or otherwise, they may relate to actions bona fide contested between the parties, or they may be against defendants liable in a representative capacity and not personally; but no distinction is made on the register. A judgment does not imply inability to pay. Judgments are not returned to the Registry if satisfied in Court Books within twenty-one days.*

RUBBER ASBESTOS FLOORINGS LTD., Bridge End Chambers, Bridge Road, Leeds. Leeds, £184 11s. 2d., April 13 1959.

PLASTIC DEVELOPMENTS, Park Cottage, Botley Road, Bishop's Waltham, Hants. Wolverhampton, £22 13s. 11d., April 6 1959.

A. C. WHITE (T/A B AND W. TYRES (1958)), 851 Harrow Road, London, N.W.10. Bloomsbury, £61 12s., April 9 1959.

ROCKS PLASTIC FOAM CO. LTD., The Rocks, Ashurst Wood, R/O 71 London Road, East Grinstead, Sussex, plastic material dealers. Northwich, £23 10s. 1d., April 7 1959.

Rubber Journal and International Plastics **CLASSIFIED ADVERTISEMENTS**

APPOINTMENTS VACANT

6d. a word, Minimum 10/- **Box 2/-**

AUSTRALIAN company, well-established, wishing to broaden their activities, have a vacancy for a technical man interested in development work. Applicants should have a science degree or good professional qualifications, several years experience in general rubber manufacture and knowledge of practical works procedure. Attractive working conditions and good starting salary. Early interview will be arranged with member of the company at present visiting England.—Box 344. (344)

ESTIMATING department of company specializing in rubber bonded units and mouldings require another experienced estimator, owing to expansion. Pension and life assurance scheme. Good opportunity for right man.—Andre Rubber Co. Ltd., Kingston By-Pass, Surbiton, Surrey. (367)

INSPECTORS with experience in the rubber industry and with some engineering background are required by rubber manufacturers in South London. A.I.D. approval advantageous. Experience in at least one of the following will be required: Mill room and calendering; extrusions; spreadproofing; hand-fabricated G.R.G. These are permanent positions and a contributory pension scheme is in operation. The commencing salary will be £900 per annum. Apply giving full details of age and experience to:—Box 341. (341)

APPOINTMENTS VACANT

DOWTY SEALS LTD.
ASHCHURCH, GLOS.

require:—

RUBBER TECHNOLOGIST/CHEMIST

to be engaged on research connected with the development of oil resistant compounds for use in extremes of temperature.

PRODUCTION ENGINEERS

experienced in the general aspects of rubber component production, preferably oil seals, and with particular experience of rubber to metal bonding. Lodging allowances, assistance with house purchase and removal expenses will be available in approved cases.

Apply, giving full details, to:—
The Personnel Manager. (350)

APPOINTMENTS VACANT

INDUSTRIES LTD.

have a vacancy in the development department, Leyland, for a rubber technologist of L.I.R.I. standard or experience which would be comparable with this standard. Age 18-30 years. Excellent prospects, working conditions and canteen. Superannuation scheme.—Please write giving details of training, experience and present salary to the Personnel Officer, BTR Industries Ltd., Leyland, Lancs. All applications will be treated in the strictest confidence. (338)

PLANT engineer for expanding company at Northampton equipped with Banbury and Intermix machines, modern oil-fired steam raising plant. Electrical and hydraulic services. To take responsibility for electrical and mechanical maintenance staff. Apply in writing.—Chief Engineer, Long and Hambly Ltd., Rubber and Plastic Manufacturers, Slater Street, High Wycombe, Bucks. (356)

RUBBER manufacturers, London, N.W.10, area, require junior to work on laboratory developments of new products.—Apply in first instance with full details of education and experience to Box 359. (359)

WORKS chemist required to take charge of laboratory. Experience in general mechanical mouldings and resin rubber (solid and semi-blown). Permanent position and pension scheme available.—Apply giving full details of previous experience, qualifications and salary required to Works Manager, Tuck and Co. Limited, Peregrine Road, Hainault, Essex. (357)

YOUNG lady required for rubber testing laboratory by works situated London, N.W.10, area for control testing of raw materials and finished products. Previous experience not necessary in the industry since training will be given.—Reply by letter stating full particulars to Box 358. (358)

CHIEF DEVELOPMENT ENGINEER

Applications are invited for the post of chief development engineer in a rapidly expanding company engaged in the manufacture of rubber components used in the engineering industry. The company employs some 350 people, is located in the North of England and is one of a group which has a national reputation in the light engineering field.

The chief development engineer will be directly responsible to the works director for the operation of the engineering and chemical laboratories. He will be required to plan and supervise the testing of existing products, investigate the use of new materials and assist in the development of new products. Applicants should be technically qualified and have practical experience in design, experimental and development work. Experience in the field of pneumatics and hydraulics would be an advantage.

The salary will be commensurate with the executive responsibility involved and the post is pensionable. Preferred age range 28 to 38.

There are prospects of further promotion within the company and within the group and there will be opportunity to visit the United States.

Applications, which will be treated with strictest confidence, stating age, qualifications, experience, appointments held with salaries earned, should be addressed to Urwick, Orr and Partners Ltd., St. Paul's House, St. Paul's Street, Leeds, 1, quoting reference CW/1341 on the envelope. (351)

APPOINTMENTS VACANT

RUBBER TECHNICIAN

Turner Brothers Asbestos Co. Ltd., Hindley Green, near Wigan, require a man 25/35 years of age with experience in the engineering, rubber or chemical industries. It is desirable that he should hold appropriate professional qualifications, be able to control production and inspection personnel, work as a member of a team and be capable of making decisions.—Apply in the first instance, stating age, qualifications and experience, to Chief Personnel Manager, Turner Brothers Asbestos Co. Ltd., Spotland, Rochdale. Mark envelope "Rubber Technician." (360)

APPOINTMENTS WANTED

6d. a word, Minimum 10/-. Box 2/-.

EXECUTIVE, A.I.R.I., with wide technological, research and production experience, at home and abroad, in compound formulation and mixing, tyre manufacture, latex compounding for foam and other products, plantation experience, manufacture of mouldings, mechanicals, all types bonding, production industrial and printers' rollers, drums, proofing and other aspects of the industry, offers his services to those desiring to increase productivity and develop new lines.—Box 362. (362)

GRADUATE chemist (36), British, considerable experience plastic flooring technology, some experience linoleum, bitumen, polishes, etc., seeks congenial position.—Box 365. (365)

RUBBER technologist, A.I.R.I., returning to U.K., seeks post. Available employment immediately.—Box 363. (363)

ARTICLES FOR SALE (SECONDHAND)

6d. a word, Minimum 12/6 Box 2/-

FOR sale, 2 second-hand reconditioned 70in. spreading machine, one 27ft. long and the other 18ft. long. Two second-hand reconditioned Iddons double-geared mixing mills, 16in. x 40in. One chalking or dusting machine 72in. wide.—Box 343. (343)

K4 INTERMIX with 110 h.p. motor drive. 60in. x 22in. Bridge single-geared mill with 100 h.p. drive. 30in. x 24in. Cracker with 200 h.p. drive. 450-ton six-daylight press by Shaw, platens 54in. square.—Reed Brothers (Engineering) Ltd., Replant Works, Woolwich Industrial Estate, London, S.E.18. Tel.: Woolwich 7611/6. (364)

LANGLEY drier conveyor. Steam heated, width 88in., length 70ft. 5 fan units electrically driven, 400/440 volt.—Box 352. (352)

OAKES continuous automatic mixer, class No 68/24. 1-3,900 gallons, and 1-1,500 gallons steel storage tanks, unlined.—Box 353. (353)

ONE 2½in. Bridge plastics extruder. 40ft. hauloff. Water-cooled screw. Steam-heated barrel. Electrically-heated head. Locker-Traylor feed hopper. Variable-speed motor and gearbox. Control panel.—Box 361. (361)

ARTICLES WANTED

6d. a word, Minimum 12/6 Box 2/-

REQUIRED. Veneer and plywood press, multiplate preferably electric but would consider steam. Interwood, Schubert or similar.—Full details, including age, price, etc., to Box 355. (355)

URGENTLY required, modern 78-in. Rotocure.—Box 354. (354)

PATENTS

6d. a word, Minimum £1. Box 2/-.

PATENT No. 776995 "Foam Rubber Bandage Material" for sale or licence.—Apply Chatwin and Company, Chartered Patent Agents, 253 Gray's Inn Road, London, W.C.1. (366)